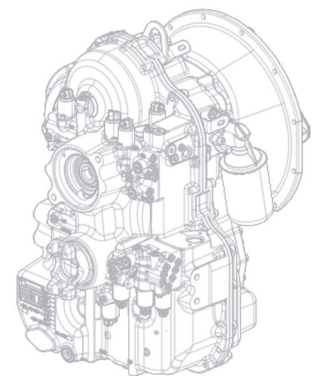
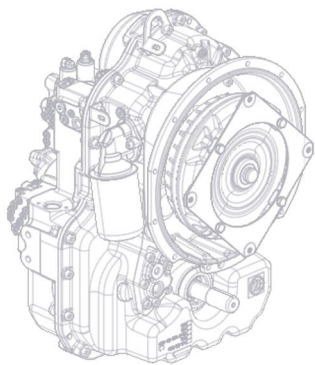
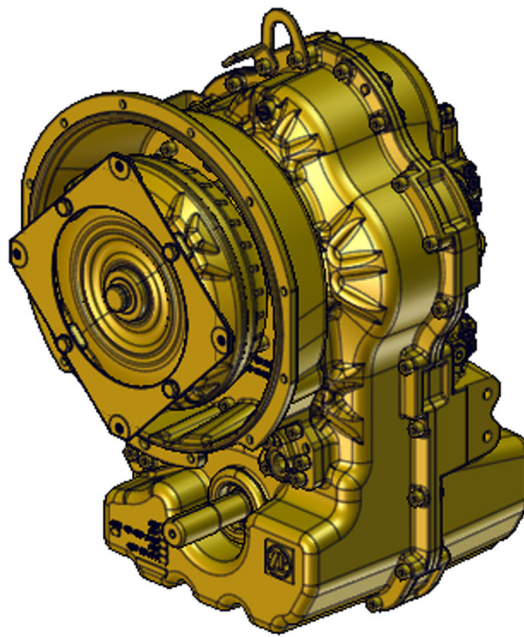
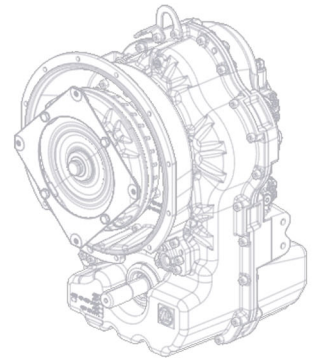
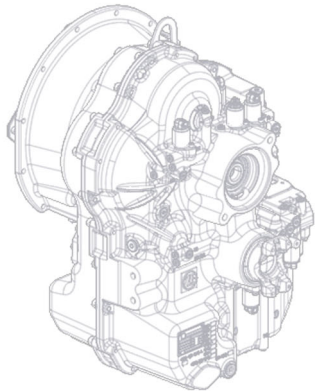


SERVICE MANUAL

ZF Transmission



Pub1. NO. 2938003100



REPAIR MANUAL

for

ZF - ERGOPOWER

4/5 WG-94

IMPORTANT INFORMATION:

Due to the great variety of ZF units it is necessary to limit disassembly and reassembly manuals to a current ZF production unit. Continuous technical upgrading of the ZF units and extensions concerning design options may require differing steps, which can be carried out by qualified specialists without greater difficulties by means of the perspective views included in the corresponding spare parts lists.

This disassembly and reassembly manual is based on the design level of a ZF production unit at the time of issue of the manual.

For information on operation, maintenance and for descriptions please refer to the relating Operating Instructions .

ZF Friedrichshafen AG reserves the right to replace this disassembly and reassembly manual by a successive edition at any time without advance notice. Upon request, ZF Friedrichshafen AG will advise which edition is the latest one.

ATTENTION:

Observe the vehicle manufacturer's instructions and specifications for the installation and commissioning of the unit!

ZF Friedrichshafen AG

ZF Services

Donaustr. 71

D - 94034 Passau

Section: MAIP21

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This document is a translation of the German original.

Subject to technical modifications!

Design Level

3. Edition

2006/12

2012/03

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PREFACE

This documentation has been developed for specialized staff trained by ZF Friedrichshafen AG for repair and maintenance work to be made on ZF units.

This documentation describes a ZF series product with a design level valid at the date of edition.

Due to the continuous technical upgrading of the product, however, the repair of the unit at your disposal may require both deviating work steps and differing setting and testing data.

We would therefore recommend you to entrust masters and servicemen with the work on your ZF product whose practical and theoretical training is constantly updated in our training school.

The Service Stations established by ZF Friedrichshafen AG all over the world offer you:

1. Permanently trained staff
2. Specified equipment, e.g. special tools
3. State-of-the-art genuine ZF spare parts

All work is done there with utmost care and reliability.

In addition, repair work carried out by ZF Service Stations is covered by the ZF warranty within the terms of the currently applicable contractual conditions.

Any damage resulting from work which is done in an improper and unprofessional manner by third parties and any consequential costs incurred shall be excluded from this contractual liability.

This shall also be applicable if other than genuine ZF spare parts are used.

ZF Friedrichshafen AG

GENERAL

The Service Manual covers all work required for disassembly and the relating reassembly.

When repairing the transmission, ensure utmost cleanliness and that the work is done in a professional manner.

Dismantle the unit only if any damaged parts must be replaced. After removing screws or nuts, loosen lids and housing parts, which were installed with seals, by slight hammer blows with a plastic hammer. Use suitable pulling devices for removing parts being tightly installed on the shafts, such as bearings, bearing rings and similar.

Carry out disassembly and reassembly work on a clean working place. Use special tools which have been developed for this purpose. Prior to reinstallation of the parts, clean contact faces of housings and lids from residues of seals. Remove any burrs or similar irregularities with an oil stone. Clean housings and end covers, in particular corners and angles, with a suitable detergent. Damaged or heavily worn parts must be replaced, with an expert assessing whether parts subject to normal wear during operation, such as bearings, thrust washers etc. will be reinstalled.

Parts such as seal rings, locking plates, split pins etc. must generally be replaced. Radial seal rings with worn or broken sealing lip must also be replaced. In particular, ensure that no chips or other foreign bodies remain in the housing. Check the lube oil holes and grooves regarding unhindered passage.

Oil according to the relating List of Lubricants shall be applied to all bearings prior to their installation.

NOTE : Only a heating furnace or an electric drier is permitted to be used for heating up parts such as bearings, housings, etc.!

Parts fitted in heated state must be readjusted after cooling down to ensure a perfect contact.

CAUTION

When assembling the unit, exactly observe the tightening torques and setting data indicated in the manual. Tighten screws and nuts according to the enclosed standard table, unless otherwise specified.

The use of fluid seals or Molykote is not permitted for the control part in transmissions – due to a possible malfunction.

Never wash disks having organic friction linings (e.g. paper disks - adverse effect on lining adhesion).

Only dry cleaning is permitted (leather cloth).



DANGER

When using detergents, observe the manufacturer's instructions regarding their handling.

Structure of the Service Manual

The structure of this repair manual reflects the sequence of the work steps for completely disassembling the dismantled unit.

Tools required for carrying out the repair work are listed in the current text as well as in chapters "WS" (special tools) and "WH" (commercial tools).

Important information on industrial safety

As a basic principle, the workshop carrying out the repair or maintenance of ZF units shall be fully responsible for industrial safety.

The observance of all valid safety regulations and legal requirements is a prerequisite for avoiding any damage to persons and products during maintenance and repair work.

Repair workshops must familiarize themselves with these regulations prior to starting any work.

A suitably trained and skilled staff is required for a proper repair of these ZF products.

The repair workshop shall be responsible for the training.

The following safety references are used in this manual:

	CAUTION	This symbol serves as a reference to special working procedures, methods, information, use of auxiliaries etc... indicated in this repair manual.
---	----------------	--

	DANGER	This symbol identifies situations in which lacking care may lead to personal injury or damage to the product .
---	---------------	---

NOTE:	Thoroughly study this manual before starting any tests or repair work.
--------------	--

NOTE:	Figures, drawings and parts in this manual do not always represent the original; they show the working procedure. Since the figures, drawings and parts are not shown to scale, do not draw any conclusions on size and weight (not even within one and the same illustration). Carry out work according to the legend.
--------------	--

NOTE:	After repair work and tests, the expert staff must verify that the product is perfectly functioning again.
--------------	--

BEZEICHNUNG DER GESETZLICHEN EINHEITEN DENOMINATION OF STANDARD DIMENSIONS DÉNOMINATION DES DIMENSIONS STANDARDISÉES

Hinweis : längenbezogene Masse in kg/m; flächenbezogene Masse in t/m²

Note : linear density in kg/m; areal density in t/m²

Nota : densité linéaire en kg/m; densité superficielle en t/m²

Begriff Unit Unité	Formelzeichen Symbol Symbole	Neu New Nouveau	Alt Old Vieux	Umrechnung Conversion Conversion	Bemerkungen Note Nota
Masse Density Masse	m	kg (Kilogramm)	kg		
Kraft Force Force	F	N (Newton)	kp	1 kp = 9.81 N	
Arbeit Work Travail	A	J (Joule)	kpm	0.102kpm = 1J = 1Nm	
Leistung Power Puissance	P	KW (Kilowatt)	HP (DIN)	1 HP = 0.7355 KW 1 KW = 1.36 HP	
Drehmoment Torque Couple	T	Nm (Newtonmeter)	kpm	1 kpm = 9.81 Nm	T (Nm) = F (N) · r (m)
Kraftmoment Moment (Force) Moment (Force)	M	Nm (Newtonmeter)	kpm	1 kpm = 9.81 Nm	M (Nm) = F (N) · r (m)
Druck (Über-) Pressure (Over-) Pression (Sur-)	pü	bar	atü	1.02 atü = 1.02 kp/cm ² = 1 bar = 750 torr	
Drehzahl Speed Nombre de Tours	n	min -1 rpm tr/min			

VERGLEICHSTABELLE FÜR MASSEINHEITEN CONVERSION TABLE TABLEAU DE CONVERSION

25.40 mm	=	1 in (inch)
1 kg (Kilogramm)	=	2.205 lb (pounds)
9.81 Nm (1 kpm)	=	7.233 lbf x ft (pound force foot)
1.356 Nm (0.138 kpm)	=	1 lbf x ft (pound force foot)
1 kg / cm	=	5.560 lb / in (pound per inch)
1 bar (1.02 kp/cm ²)	=	14.233 psi (pound force per square inch lbf/in ²)
0.070 bar (0.071 kp/cm ²)	=	1 psi (lbf/in ²)
1 Liter	=	0.264 Gallon (Imp.)
4.456 Liter	=	1 Gallon (Imp.)
1 Liter	=	0.220 Gallon (US)
3.785 Liter	=	1 Gallon (US)
1609344 m	=	1 Mile (land mile)
0° C (Celsius)	=	+ 32° F (Fahrenheit)
0 ° C (Celsius)	=	273.15 Kelvin

TIGHTENING TORQUES FOR SCREWS (in Nm) ACC. TO ZF STANDARD 148

Friction coefficient: $\mu_{\text{tot.}} = 0.12$ for screws and nuts without rework, as well as phosphated nuts. Tighten manually!

Take tightening torques from the following chart, unless otherwise specified:

Metric ISO standard thread DIN 13, page 13

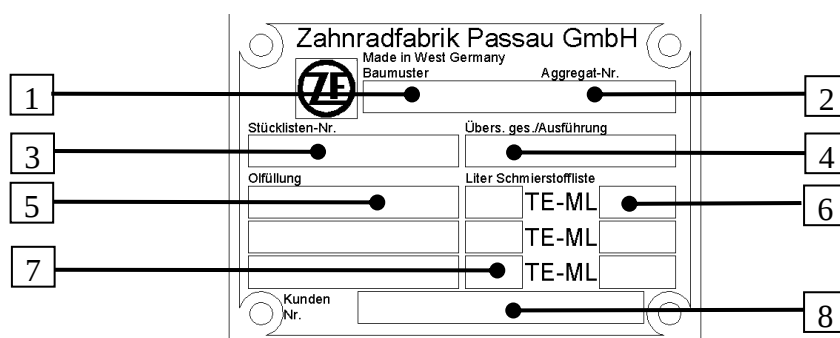
Dimension	8.8		10.9		12.9
M4	2.8		4.1		4.8
M5	5.5		8.1		9.5
M6	9.5		14		16.5
M7	15		23		28
M8	23		34		40
M10	46		68		79
M12	79		115		135
M14	125		185		215
M16	195		280		330
M18	280		390		460
M20	390		560		650
M22	530		750		880
M24	670		960		1100
M27	1000		1400		1650
M30	1350		1900		2250
M33	1850		2600		3000
M36	2350		3300		3900
M39	3000		4300		5100

Metric ISO fine thread DIN 13, page 13

Dimension	8.8		10.9		12.9
M 8 x 1	24		36		43
M 9 x 1	36		53		62
M 10 x 1	52		76		89
M 10 x 1.25	49		72		84
M 12 x 1.25	87		125		150
M 12 x 1.5	83		120		145
M 14 x 1.5	135		200		235
M 16 x 1.5	205		300		360
M 18 x 1.5	310		440		520
M 18 x 2	290		420		490
M 20 x 1.5	430		620		720
M 22 x 1.5	580		820		960
M 24 x 1.5	760		1100		1250
M 24 x 2	730		1050		1200
M 27 x 1.5	1100		1600		1850
M 27 x 2	1050		1500		1800
M 30 x 1.5	1550		2200		2550
M 30 x 2	1500		2100		2500
M33 x 1.5	2050		2900		3400
M 33 x 2	2000		2800		3300
M 36 x 1.5	2700		3800		4450
M 36 x 3	2500		3500		4100
M 39 x 1.5	3450		4900		5700
M 39 x 3	3200		4600		5300

LABELING OF IDENTIFICATION PLATE FOR ZF-POWERSHIFT TRANSMISSIONS

- 1 = Transmission type
- 2 = Transmission number
- 3 = ZF parts list number
- 4 = Total transmission ratio
- 5 = Oil filling (oil specification)
- 6 = ZF List of Lubricants
- 7 = Oil fill quantity
- 8 = Customer number



The diagram shows a rectangular identification plate for Zahnradfabrik Passau GmbH. The plate contains the following fields and labels:

- Top Left:** ZF logo (Zahnradfabrik logo)
- Top Center:** Zahnradfabrik Passau GmbH, Made in West Germany, Baumuster
- Top Right:** Aggregat-Nr.
- Middle Left:** Stücklisten-Nr.
- Middle Right:** Übers. ges./Ausführung
- Bottom Left:** Ölfüllung
- Bottom Center:** Liter Schmierstoffliste
- Bottom Right:** TE-ML (repeated three times)
- Bottom Left Corner:** Kunden Nr.

Numbered callouts point to the following fields:

- 1: Transmission type (points to the ZF logo)
- 2: Transmission number (points to the Aggregat-Nr. field)
- 3: ZF parts list number (points to the Stücklisten-Nr. field)
- 4: Total transmission ratio (points to the Übers. ges./Ausführung field)
- 5: Oil filling (oil specification) (points to the Ölfüllung field)
- 6: ZF List of Lubricants (points to the TE-ML field)
- 7: Oil fill quantity (points to the Liter Schmierstoffliste field)
- 8: Customer number (points to the Kunden Nr. field)

INFORMATION ON SPARE PARTS ORDERING:

Please indicate the following information when ordering genuine ZF spare parts:

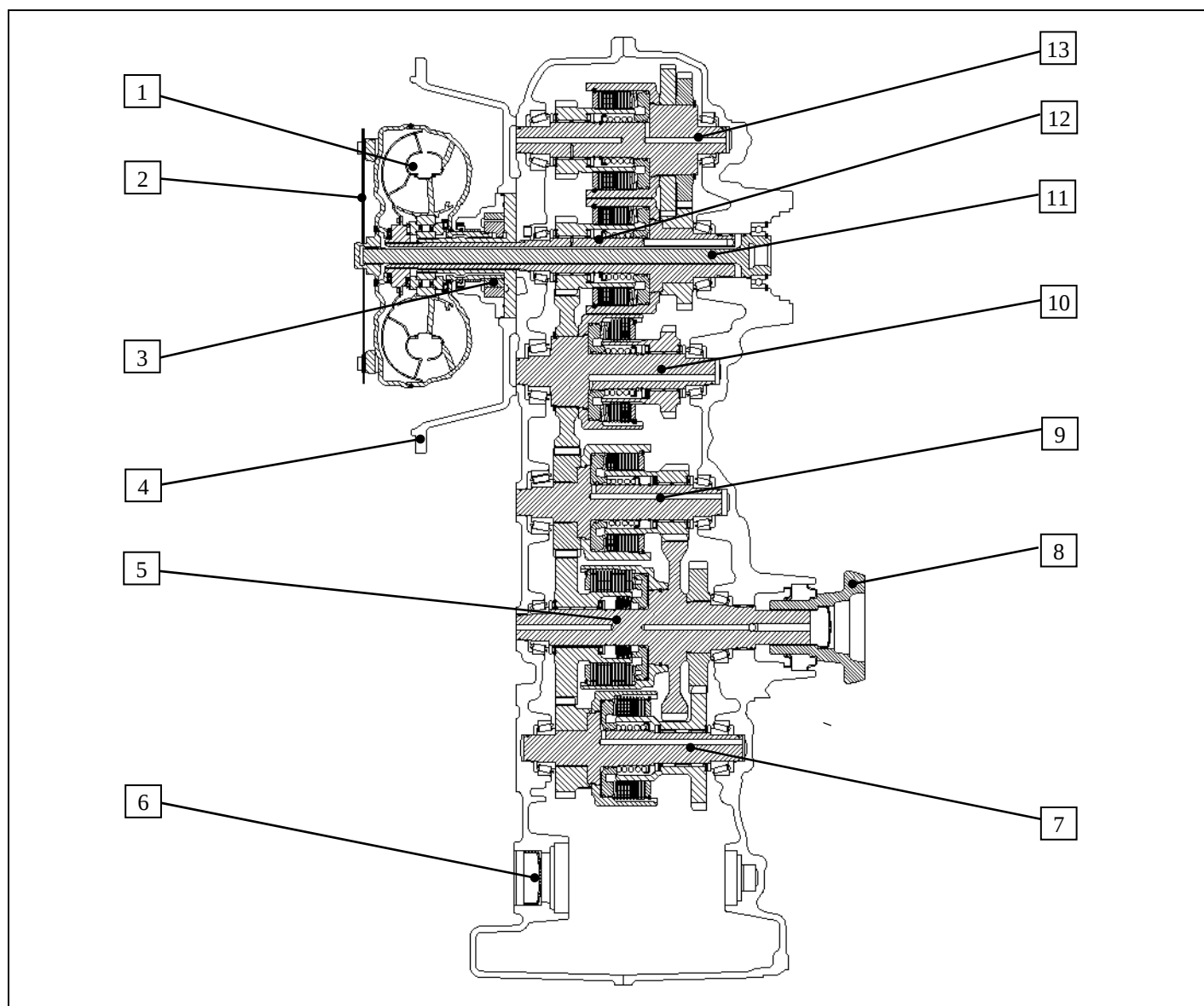
- 1. = Transmission type
- 2. = Unit number
- 3. = ZF parts list number
- 4. = Make and type of spare part
- 5. = Denomination of spare part
- 6. = Spare part number
- 7. = Shipping mode

You will find this information on the identification plate!

Please indicate all the a.m. details to avoid any mistakes in the delivery of the ordered spare parts!

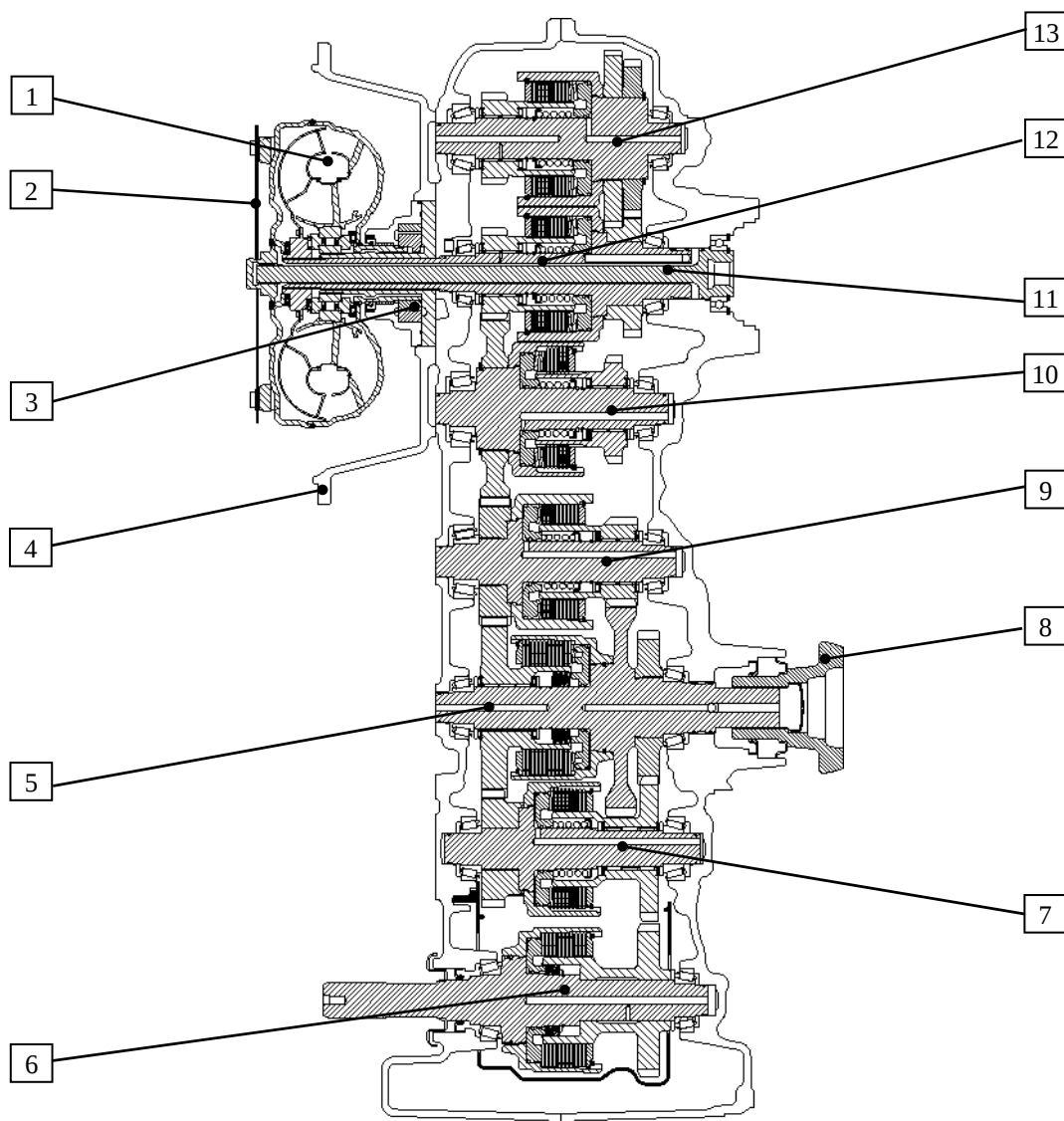
Configuration 4/5 WG-94 without front wheel drive

- | | |
|---|-------|
| 1 = Converter | |
| 2 = Flexplate for direct mount | |
| 3 = Transmission pump | |
| 4 = Converter bell | |
| 5 = Clutch shaft | „K2“ |
| 6 = Way of installation font wheel drive | „K3“ |
| 7 = Clutch shaft | „K1“ |
| 8 = Output flange | „K4“ |
| 9 = Clutch shaft | „PTO“ |
| 10 = Clutch shaft | „KR“ |
| 11 = PTO; coaxial, engine-dependent (Central shaft) | „KV“ |
| 12 = Input shaft / clutch shaft Clutch shaft | |
| 13 = Clutch shaft | |



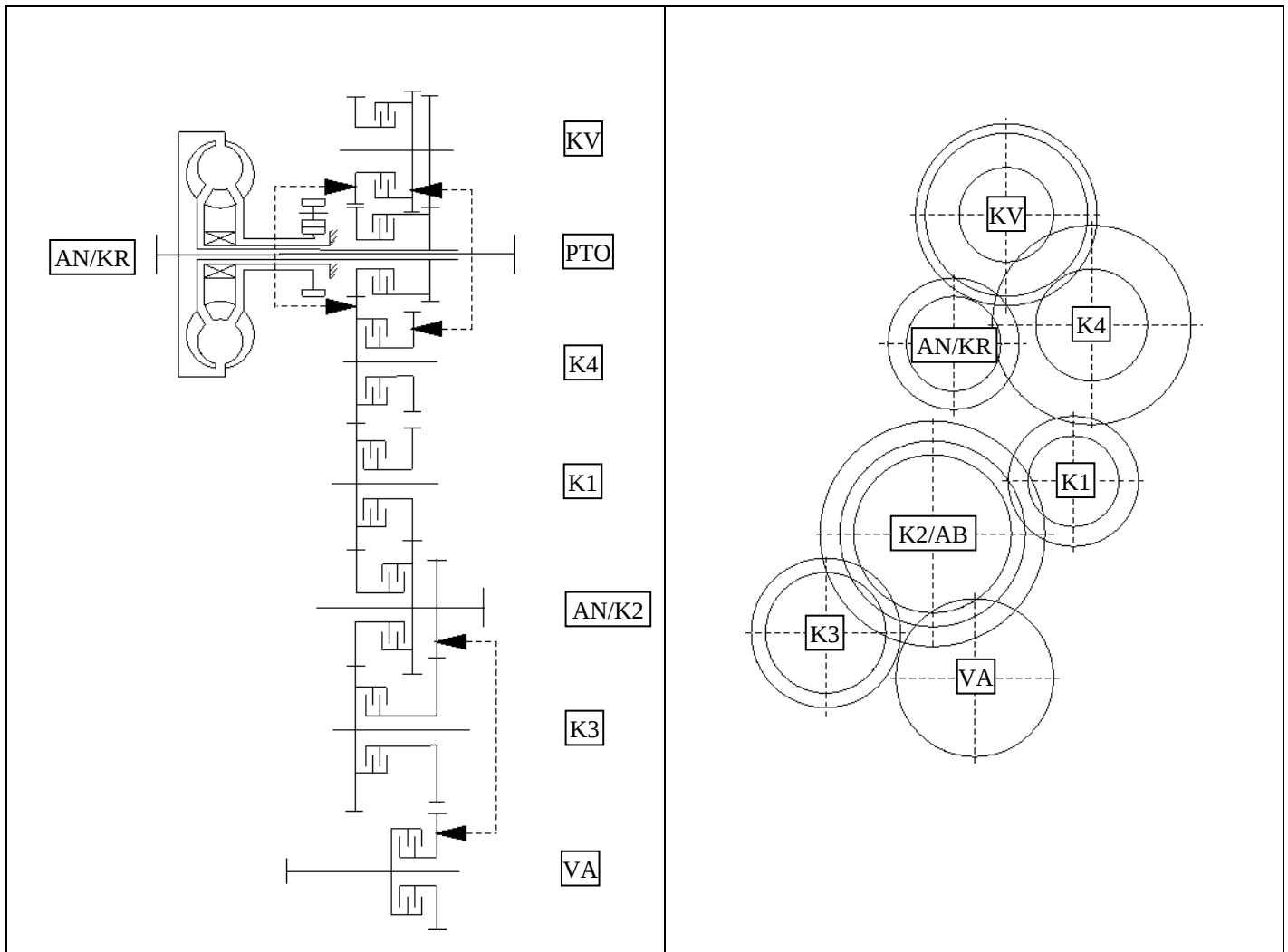
Configuration 4/5 WG-94 with front wheel drive

- | | |
|---|-------|
| 1 = Converter | |
| 2 = Flexplate for direct mount | |
| 3 = Transmission pump | |
| 4 = Converter bell | |
| 5 = Clutch shaft | „K2“ |
| 6 = Font wheel drive | |
| 7 = Clutch shaft | „K3“ |
| 8 = Output flange | |
| 9 = Clutch shaft | „K1“ |
| 10 = Clutch shaft | „K4“ |
| 11 = PTO; coaxial, engine-dependent (Central shaft) | „PTO“ |
| 12 = Input shaft / clutch shaft | „KR“ |
| 13 = Clutch shaft | „KV“ |



Transmission schematics

Gear schematics



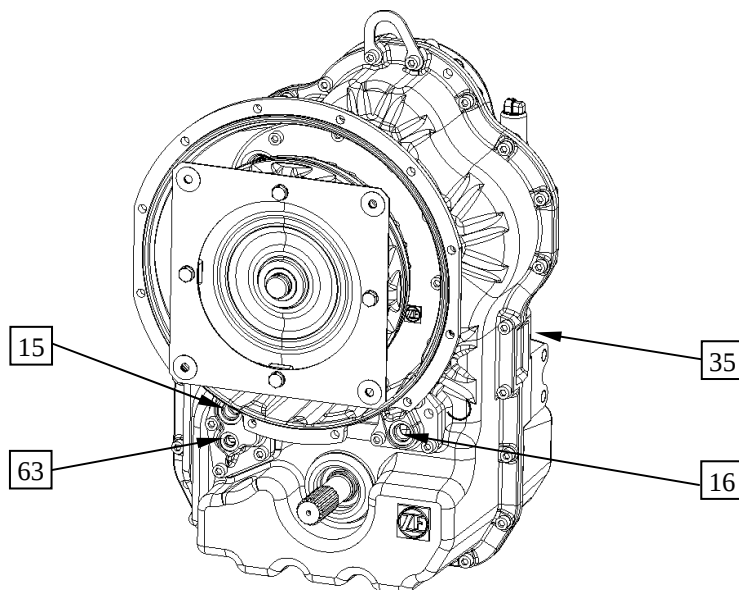
Legend:

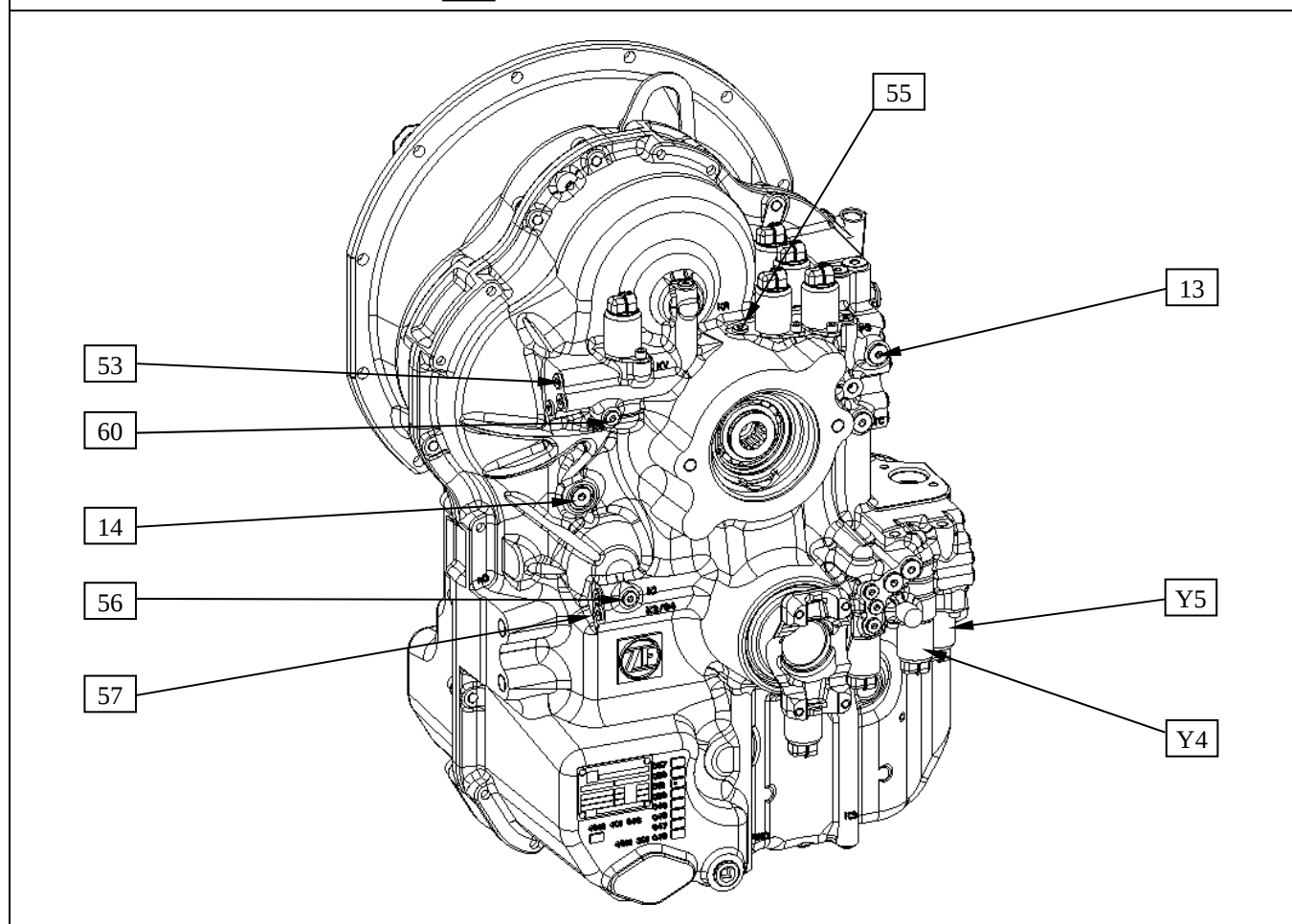
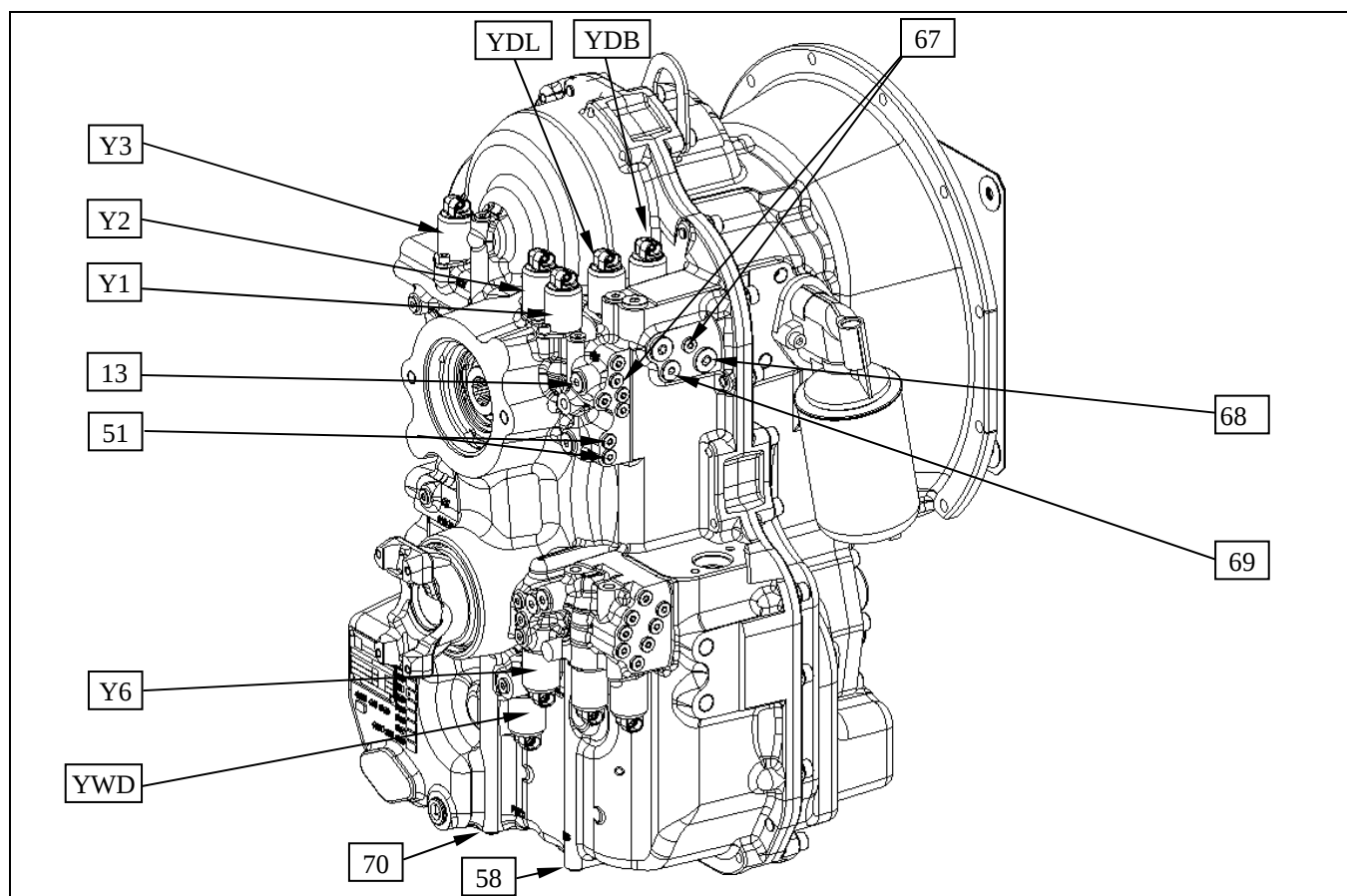
AN/KR =	Input / KV clutch	- directional clutch
KV =	KV clutch	- directional clutch
K1 =	K1 clutch	- gear clutch
K2/AB =	K2 clutch / output	- gear clutch
K3 =	K3 clutch	- gear clutch
K4 =	K4 clutch	- directional clutch
VA =	Front wheel drive	
PTO =	Power take-off; coaxial, engine-dependent	

MEASURING POINTS AND CONNECTIONS 4/5 WG-94

Take measurements when the transmission has reached operating temperature (approx. 80° - 90° C)!

No.	Denomination of item	Connection
Measuring points for pressure oil and temperature:		
51	= Before the converter – opening pressure	11+2 bar M10x1
53	= Clutch - Forward KV	16+3 bar M10x1
55	= Clutch - Reverse KR	16+3 bar M10x1
56	= Clutch K1	16+3 bar M10x1
57	= Clutch K2	16+3 bar M10x1
58	= Clutch K3	16+3 bar M10x1
60	= Clutch K4	16+3 bar M10x1
63	= Temperature after the converter 100° C; short-term 120° C	M14x1,5
67	= System pressure	16+3 bar M10x1
68	= Parking brake PB	16+3 bar 9/16" - 18 UNF
69	= Differential lock DL	16+3 bar 3/4" - 18 UNF
70	= Front wheel drive WD	16+3 bar M10x1
Connections:		
13	= Connection Parking brake (rear axle)	9/16" - 18 UNF
14	= Connection towards return line into transmissions sump	9/16" - 18 UNF
15	= Connection towards heat exchanger	7/8" 14 UNF
16	= Connection from heat exchanger	7/8" 14 UNF
Inductive transmitter:		
35	= Inductive transmitter n speedometer (Option)	M18x1,5
Valve:		
Y1 ... Y6	= Valves	
YWD	= Front wheel drive	
YDL	= Differential lock (rear axle)	
YPB	= Parking brake (rear axle)	





NOTES ON THE REQUIRED OIL GRADE:



Approved oils for 4/5 WG-94 powershift transmissions see ZF List of Lubricants TE-ML 03.



The list of lubricants is being continuously updated and can be obtained or viewed as follows:

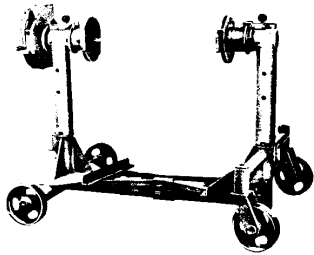
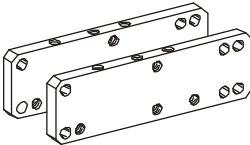
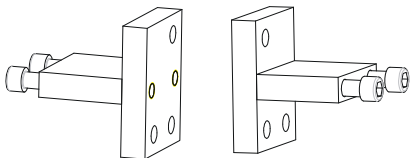
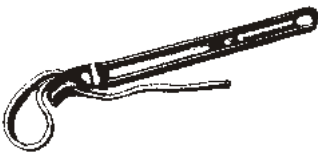
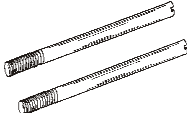
- at all ZF plants
- at all ZF service centers
- Internet <http://www.zf.com>



For information on **Operating Instructions** see relating operation manual (ZF Order No. 5872 137 002).

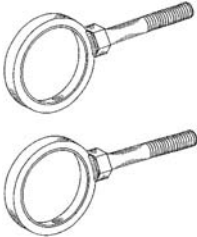
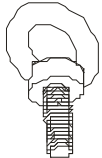
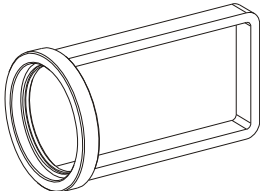
SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

ZF – ERGOPOWER 4/5 WG-94

Cons. No.	Figure	Denomination Order No.	Qty	Chapter/Fig.
1		Assembly truck assy with tilting device 5870 350 000	1	1/1
2		Holding fixtures 5870 350 063	1	1/1
3		Clamping angles 5870 350 136	1	1/1
4		Belt wrench 5870 105 005	1	1/4
5		Adjusting screws 5870 204 007	1	3/7

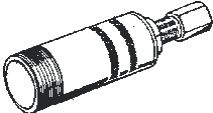
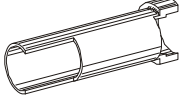
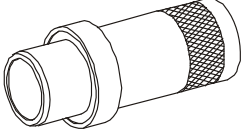
SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

ZF – ERGOPOWER 4/5 WG-94

Cons. No.	Figure	Denomination Order No.	Qty	Chapter/Fig.
6		Eye bolt assortment 5870 204 002	1	4/2
7		Eyebolts 5870 204 080	1	4/8 7/21 7/22
8		Assembly aid 5870 345 114	1	5.1/9_6.2/8_6.6/8 5.2/9_6.3/6_6.7/5 5.3/9_6.3/8_6.7/5 5.4/9_6.4/6 5.4/24_6.4/9 5.5/8_6.4/29 5.6/9_6.3/2 6.1/6_6.5/6 6.1/8_6.5/8 6.2/6_6.6/6
9		Grab sleeve 5873 001 026	1	5.1/14 5.4/14 5.4/29 5.7/10
10		Basic tool 5873 001 000	1	5.1/14 5.3/14 5.4/14 5.4/29 5.6/14 5.7/10

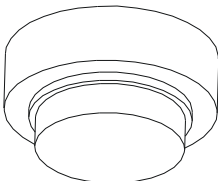
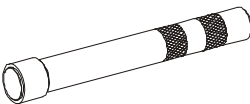
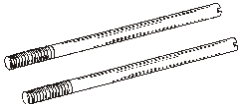
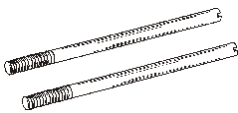
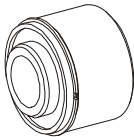
SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

ZF – ERGOPOWER 4/5 WG-94

Cons. No.	Figure	Denomination Order No.	Qty	Chapter/Fig.
11		Grab sleeve 5873 000 029	1	5.2/14 5.4/17 5.5/13 5.7/2
12		Basic tool 5873 000 001	1	5.2/14 5.4/17 5.5/13 5.7/2
13		Grab sleeve 5873 011 011	1	5.3/14 5.6/14
14		Assembly aid 5870 506 128	1	5.7/7 6.7/8
15		Driver tool 5870 048 219	1	7/2

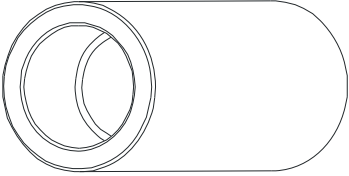
SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

ZF – ERGOPOWER 4/5 WG-94

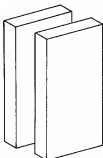
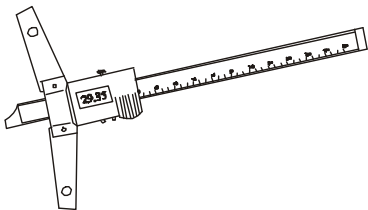
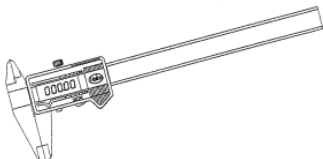
Cons. No.	Figure	Denomination Order No.	Qty	Chapter/Fig.
16		Driver tool 5870 048 309	1	7/8
17		Drift 5870 705 012	1	7/10
18		Adjusting screws 5870 204 007 M10	1	7/13
19		Adjusting screws 5870 204 011 M8	1	7/16
20		Driver tool 5870 048 200	1	8/1

SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

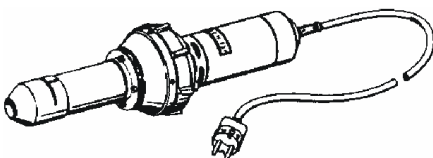
ZF – ERGOPOWER 4/5 WG-94

Cons. No.	Figure	Denomination Order No.	Qty	Chapter/Fig.
21		Driver tool 5870 048 310	1	8/8 8/9

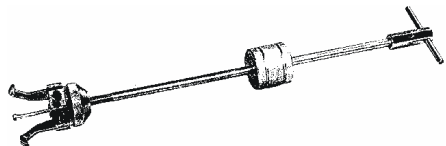
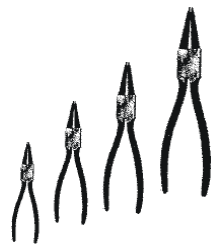
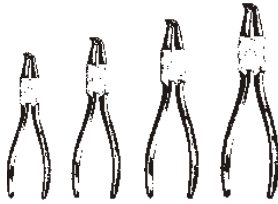
COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order no.	Qty.	Chapter/Fig
1		<u>Magnetic stand</u> 5870 200 055	1	Universal
2		<u>Dial indicator</u> 5870 200 057	1	Universal
3		<u>Gauge blocks</u> 5870 200 066 70 mm 5870 200 067 100 mm	1	Universal
4		<u>Digital depth gauge</u> 5870 200 072 200 mm 5870 200 114 300 mm	1	Universal
5		<u>Digital caliper gauge</u> 5870 200 109 150 mm	1	Universal

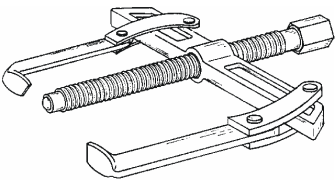
COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order no.	Qty.	Chapter/Fig
6		<u>Torque wrench</u> 5870 203 030 0.6 -6.0 Nm 5870 203 031 1.0 – 12 Nm 5870 203 032 3.0 – 23 Nm 5870 203 033 5.0 – 45 Nm 5870 203 034 10 – 90 Nm 5870 203 039 80 – 400 Nm 5870 203 016 140 – 750 Nm 5870 203 011 750 - 2000 Nm	1	Universal
7		<u>Hot air blower</u> 5870 221 500 230 V 5870 221 501 115 V	1	Universal
8		<u>Plastic hammer</u> 5870 280 004 Ø 60 mm <u>Substitute nylon insert</u> 5870 280 006	1	Universal
9		<u>Lifting strap</u> 5870 281 026	1	Universal

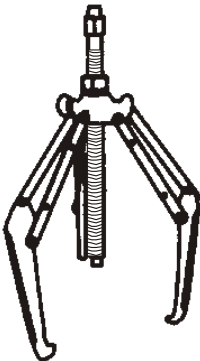
COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order no.	Qty.	Chapter/Fig
10		<u>Lifting chain</u> 5870 281 047	1	Universal
11		<u>Pry bar</u> 5870 345 071	1	Universal
12		<u>Striker</u> 5870 650 004	1	Universal
13		<u>Set of internal pliers</u> I1-I2-I3-I4 5870 900 013	1	Universal
14		<u>Set of internal pliers</u> I11-I21-I31-I41 90° 5870 900 014	1	Universal

COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order no.	Qty.	Chapter/Fig
15		<u>Set of external pliers</u> A1-A2-A3-A4 5870 900 015	1	Universal
16		<u>Set of external pliers</u> A01-A02-A03-A04 90° 5870 900 016	1	Universal
17		<u>Two-armed puller</u> 5870 970 001 Jaw width 80 mm Throat depth 100 mm 5870 970 002 Jaw width 120 mm Throat depth 125 mm 5870 970 003 Jaw width 170 mm Throat depth 125 mm 5870 970 004 Jaw width 200 mm Throat depth 175 mm 5870 970 006 Jaw width 350 mm Throat depth 250 mm 5870 970 007 Jaw width 520 mm Throat depth 300 - 500 mm 5870 970 026 Jaw width 250 mm Throat depth 200 mm 5870 970 028 Jaw width 380 mm Throat depth 200 mm	1	Universal

COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order no.	Qty.	Chapter/Fig
18		<u>Three armed puller</u> 5870 971 001 Jaw width 85 mm Throat depth 65 mm 5870 971 002 Jaw width 130 mm Throat depth 105 mm 5870 971 003 Jaw width 230 mm Throat depth 150 mm 5870 971 004 Jaw width 295 mm Throat depth 235 mm 5870 971 005 Jaw width 390 mm Throat depth 270 mm 5870 971 006 Jaw width 640 mm Throat depth 300 mm	1	Universal

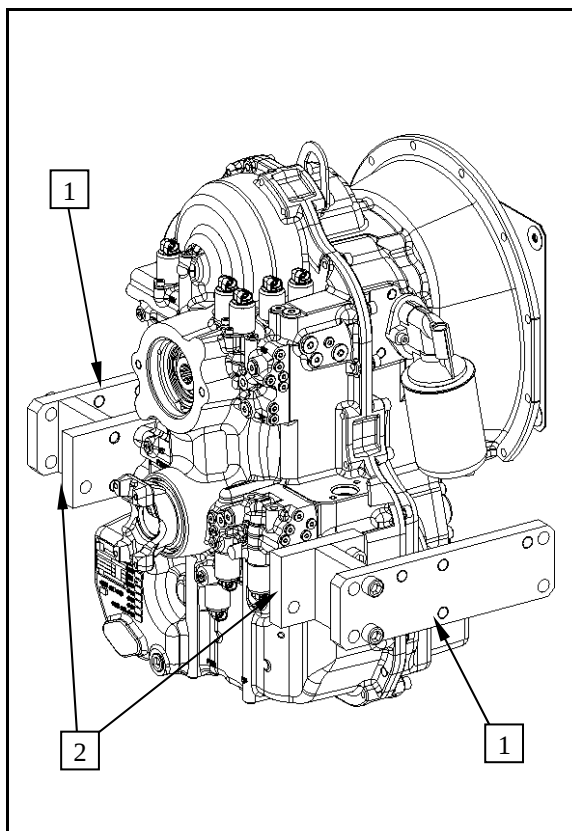


Figure 1

1. DISASSEMBLY:

Transmission 4/5 WG-94

Attach transmission to the assembly truck by means of holding fixtures (1) and clamping angles (2).

(S) Assembly truck	5870 350 000
(S) Holding fixtures	5870 350 063
(S) Clamping angles	5870 350 136

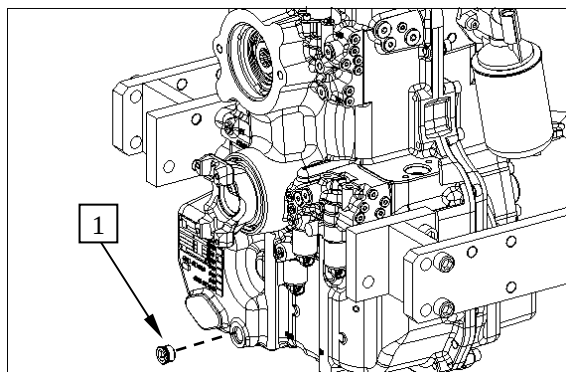


Figure 2



Drain oil prior to starting disassembly!

Remove screw plug (1).



Disposal of oil according to legal requirements!

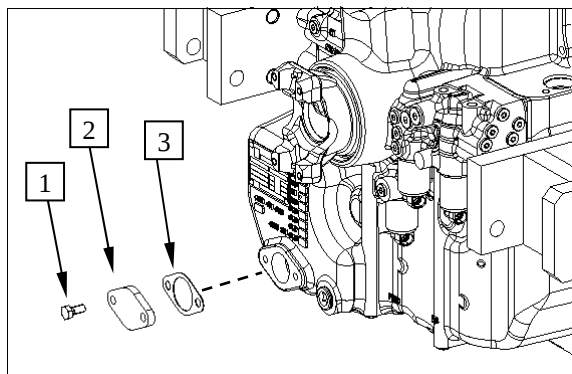


Figure 3



The figure shows the mounting provision for oil filler tube with oil dipstick (option)!

Loosen hexagon screw (1) and remove cover (2) and seal (3).



If an oil filler tube with oil dipstick is installed instead of the cover (2), these two parts must be removed.

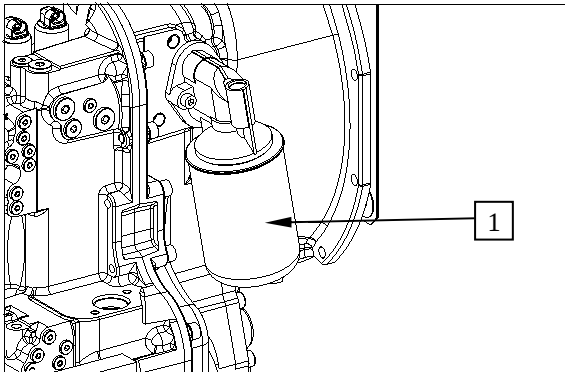


Figure 4

Separate ZF fine filter (1) from the filter head by means of a belt wrench.

(S) Belt wrench 5870 105 005

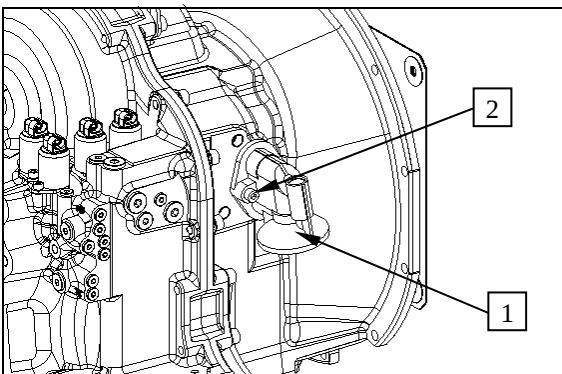


Figure 5

Loosen cylindrical screws (2) and separate filter head (1) from the transmission housing.

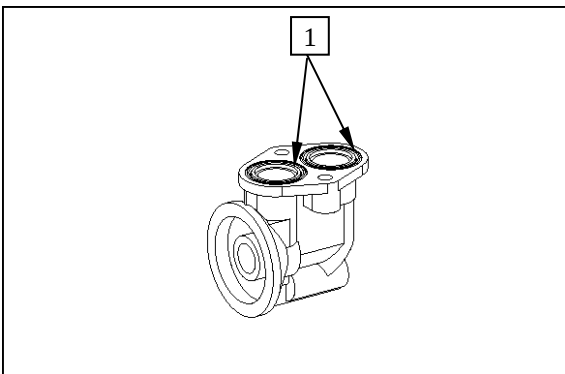


Figure 6

Remove both O-rings (1) out of the annular groove of the filter head.

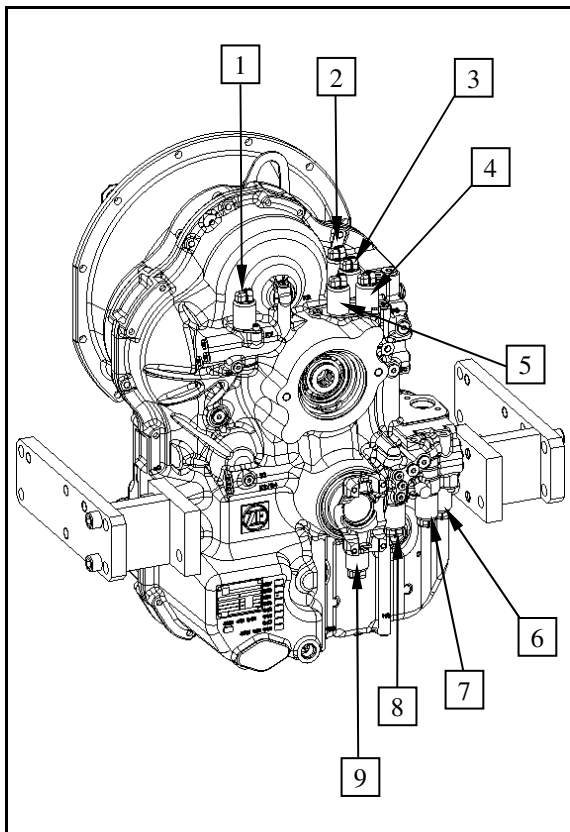


Figure 1

2. DISASSEMBLY:

Solenoid valves, inductive sensor, screw plugs and nozzles (orifices)

Loosen cylindrical screws, remove bracket and pull solenoid valves off the holes.

Mark solenoid valves (different versions).

- 1 = Y1 (control valve)
- 2 = YPB (parking brake - rear axle)
- 3 = YDL (differential lock - rear axle)
- 4 = Y3 (control valve)
- 5 = Y2 (control valve)
- 6 = Y5 (control valve)
- 7 = Y4 (control valve)
- 8 = Y6 (control valve)
- 9 = YWD (front wheel drive)

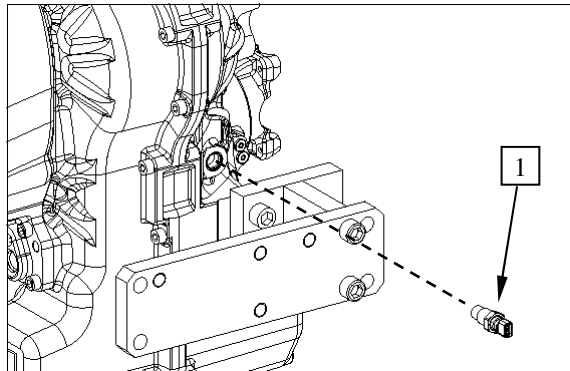


Figure 2

Version with inductive sensor (option)!

Loosen inductive sensor (1).

Remove O-ring !

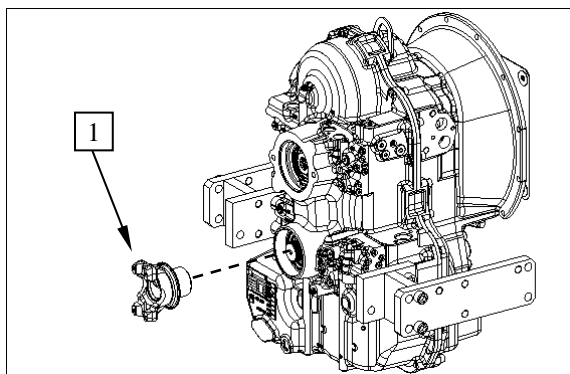


Figure 3

Pull output flange (1) off the output shaft.

Remove all screw plugs and nozzles (orifices)!

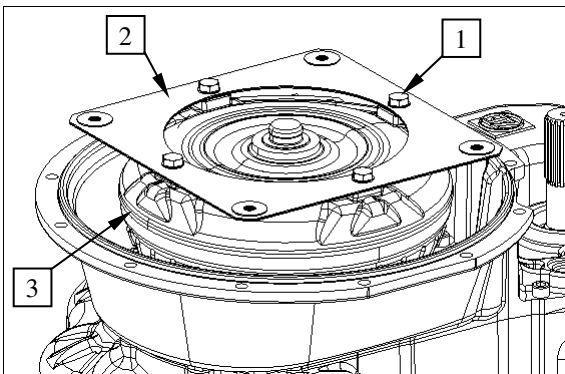


Figure 1

3. Disassembly of engine connection, main pressure valve and converter safety valve

3.1 Engine connection

Loosen hexagon screws (1) and separate flexplate (2) from converter (3).

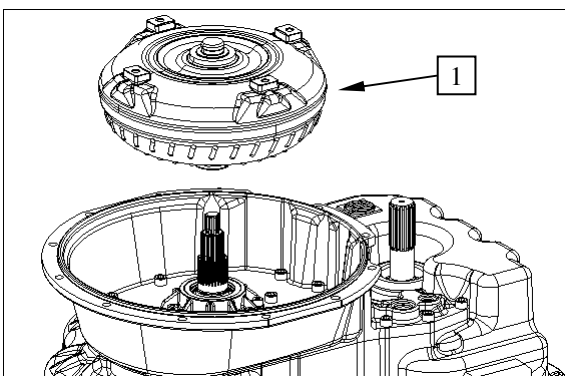


Figure 2

Pull off converter (1) by hand.

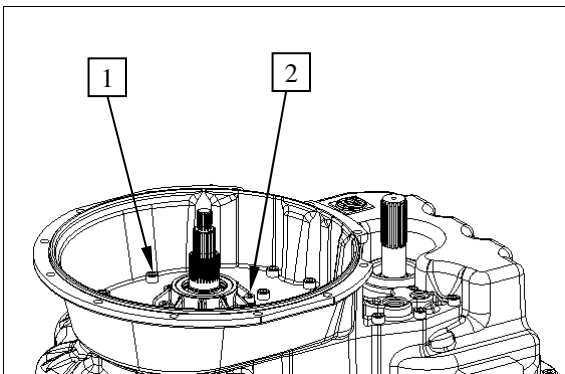


Figure 3

Loosen bolted connection between converter bellhousing/housing (1) and transmission pump/housing (2) .

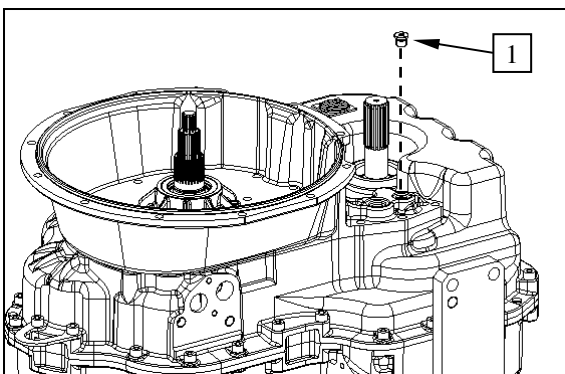


Figure 4

Loosen screw plug „measuring point 63“ (1).



Remove O-ring!

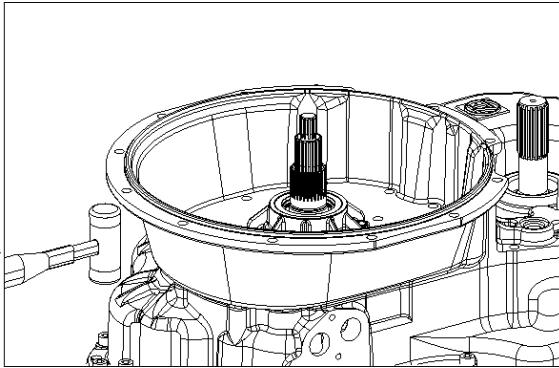


Figure 5

Separate converter bellhousing from the mounting face of the transmission housing by means of slight hits with a plastic hammer.

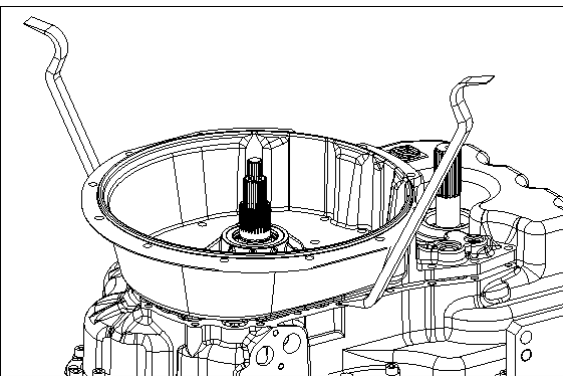


Figure 6

Remove converter bellhousing by means of assembly lever.



Difficult disassembly due to fixing by cylindrical pins!

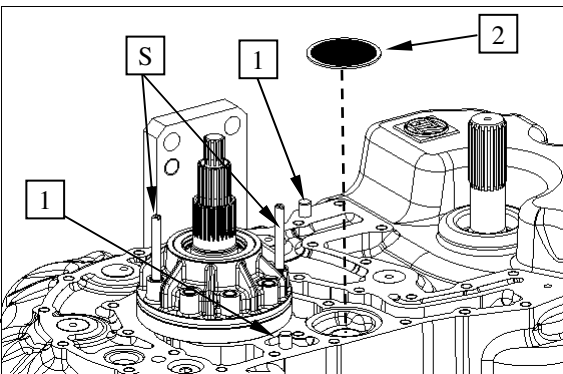


Figure 7

If required, remove both cylindrical pins (1).

Remove filter (2).



Transmission pump cannot be separated from the housing until the 4 cylindrical screws of the housing inner side have been loosened.



Fit adjusting screws to ensure that the transmission pump is centered at the housing after the 4 cylindrical screws have been loosened.

(S) Adjusting screws (M10)

5870 204 007

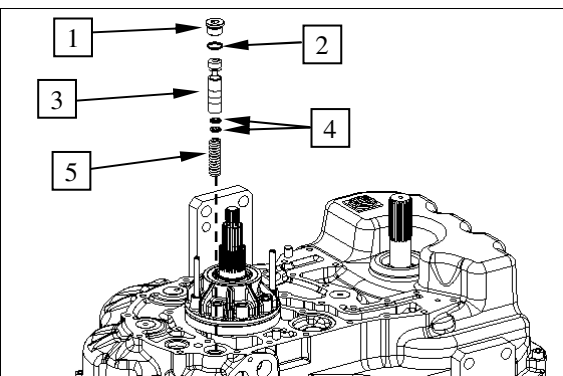


Figure 8

3.2 Main pressure valve and converter safety valve

Loosen screw plug (1) and remove main pressure valve (control pressure valve) :

Main pressure valve consists of:

- 1 = screw plug
- 2 = O-ring
- 3 = piston
- 4 = spacer ring
- 5 = compression spring

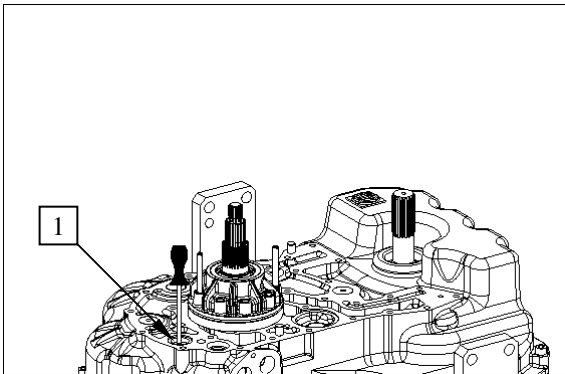


Figure 9

- ☞ **Functional check of converter safety valve (1).**
Use a screwdriver to check the movability of the ball in the valve.
- ☞ **If the valve is o.k., it does not need to be removed.**
- ☞ **Valve assy is installed in the housing - not visible !**

4. Removal of clutches, central shaft and disassembly of transmission pump

4.1 Removal of clutches

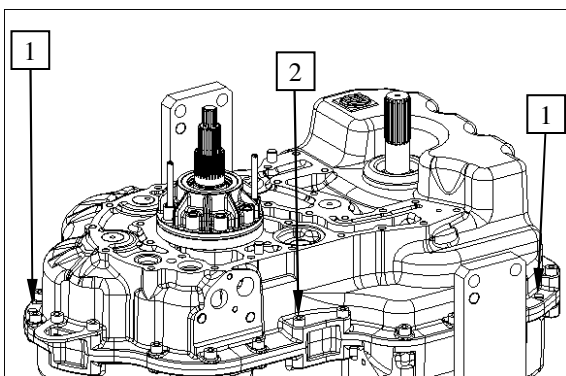


Figure 1

Force out cylindrical pins (1).

Loosen bolted connection (2) of housing front and rear part.

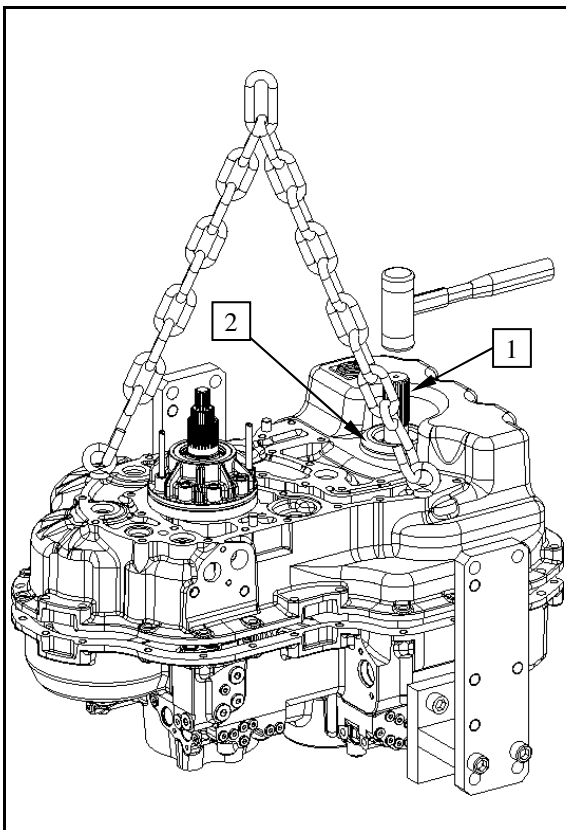


Figure 2

Separate housing front part from transmission housing rear part by means of lifting device (approx. 1 cm).

Use the plastic hammer to reset the output shaft (1) of the front wheel drive to its initial position, thus separating the screen sheet (2) from the shaft of the clutch.

(S) Eye bolts assortment 5870 204 002

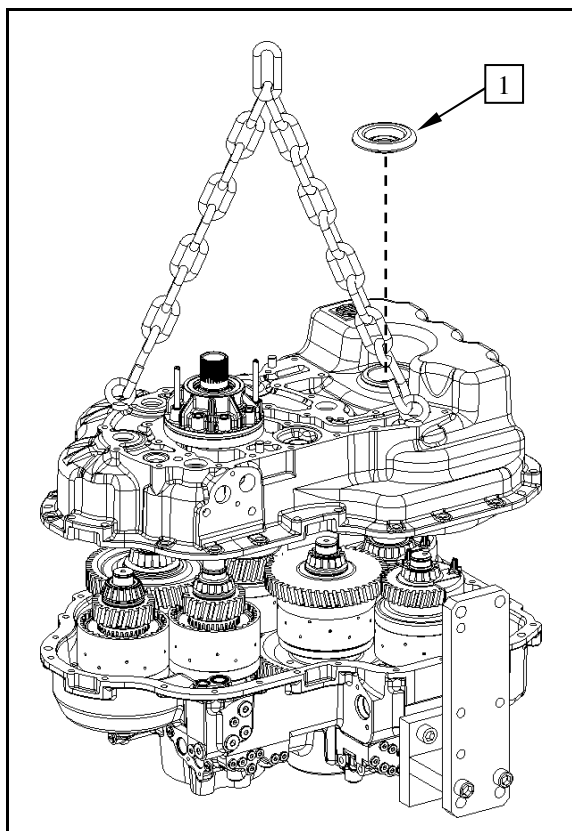


Figure 3

Remove screen sheet (1) and separate transmission housing front part by means of lifting device.

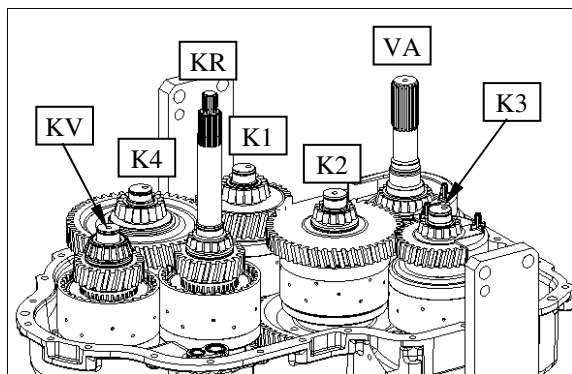


Figure 4

Designation of clutches:

- KV = forward clutch (directional clutch)
- KR = reverse clutch (directional clutch)
- K1 = K1 clutch (gear clutch)
- K2 = K2 clutch (gear clutch)
- K3 = K3 clutch (gear clutch)
- K4 = K4 clutch (directional clutch)
- VA = front wheel drive clutch

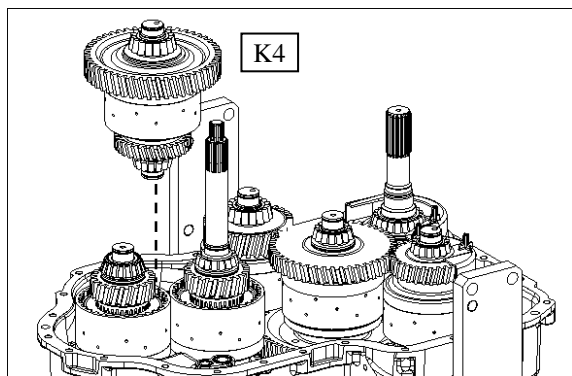


Figure 5

Remove K4 clutch.

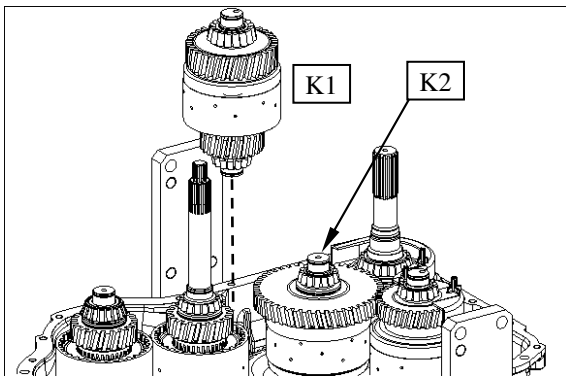


Figure 6

Slightly lift clutch (K2) and remove clutch (K1).

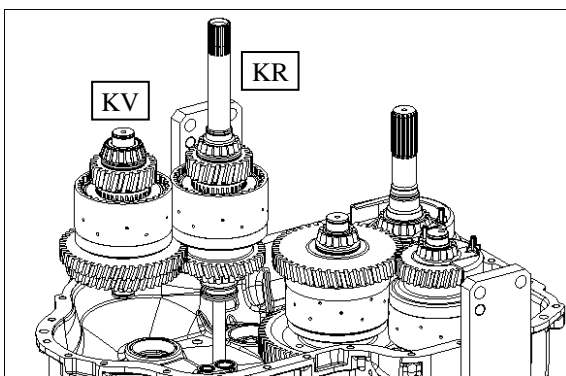


Figure 7

Lift KV and KR clutch off the bearing outer rings jointly and then remove them one after the other.

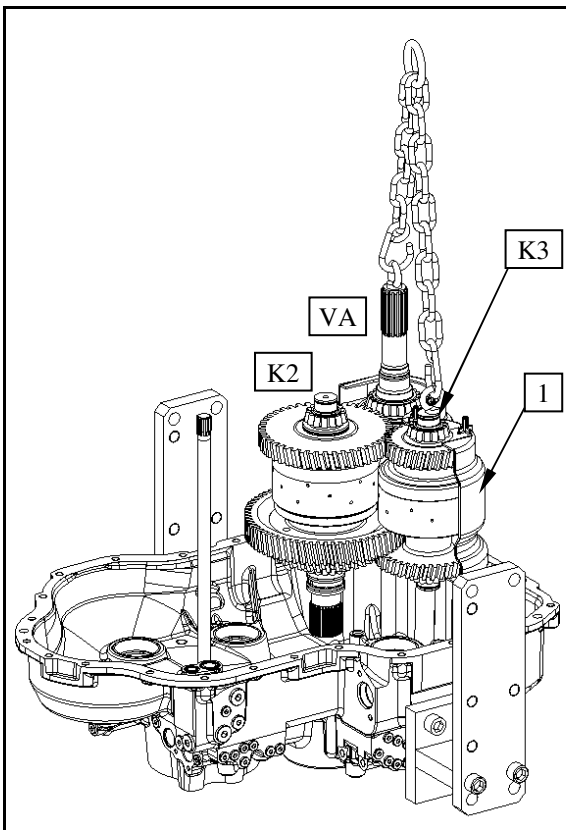


Figure 8

Jointly remove VA, K2 and K3 clutch together with screen sheet (1).

Use the lifting device to jointly lift VA and K3 clutch together with K2 clutch, and then remove the components one after the other.

(S) Eyebolts 5870 204 080

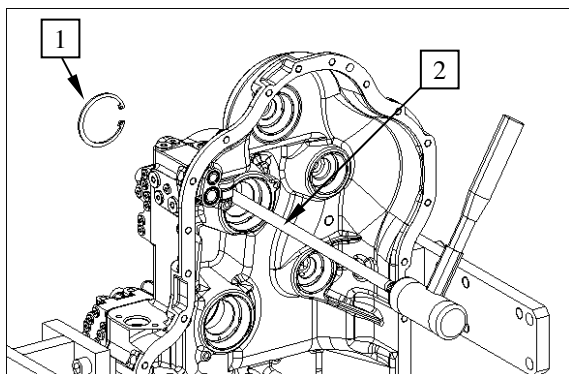


Figure 9

Snap out retaining ring (1) and remove central shaft (2).

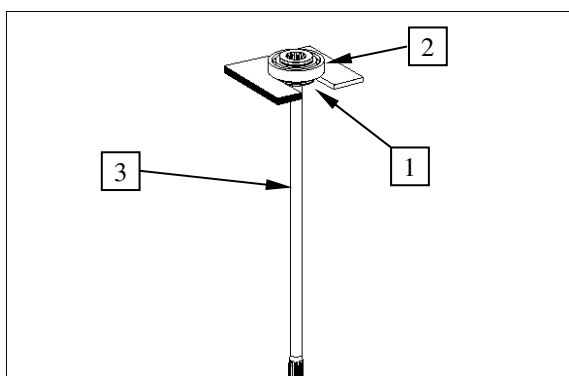


Figure 10

Snap out rectangular ring (1).

Press ball bearing (2) off the central shaft (3).

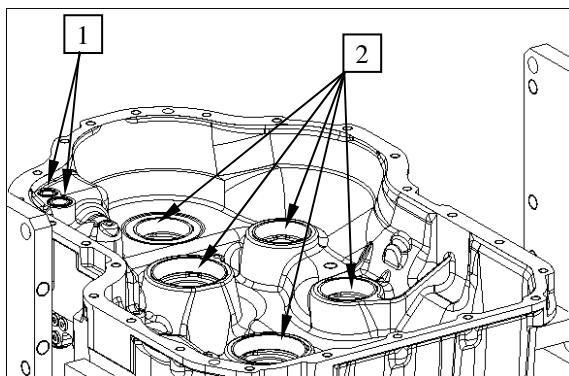


Figure 11

Remove O-rings (1).

Remove all bearing outer rings (2) from the housing rear part.

⚠ If, contrary to the ZF recommendation, the tapered roller bearings of clutches are not replaced, it is imperative to ensure the previous pairing (bearing outer ring / bearing inner ring).

⚠ Bearing outer ring and bearing inner ring must be marked!

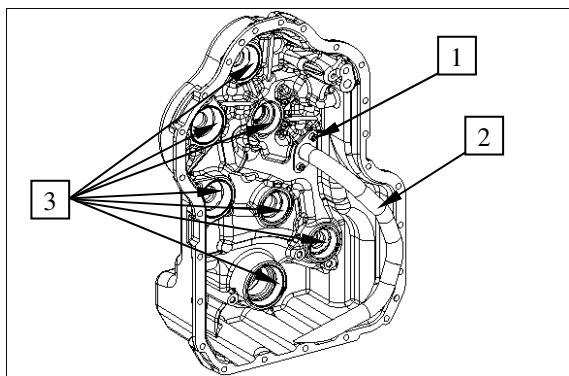


Figure 12

Loosen the cylindrical screws (1) and remove suction tube (2) .

Remove all bearing outer rings (3) from the housing front part.

⚠ If, contrary to the ZF recommendation, the tapered roller bearings of clutches and input are not replaced, it is imperative to ensure the previous pairing (bearing outer ring / bearing inner ring).

⚠ Bearing outer ring and bearing inner ring must be marked!

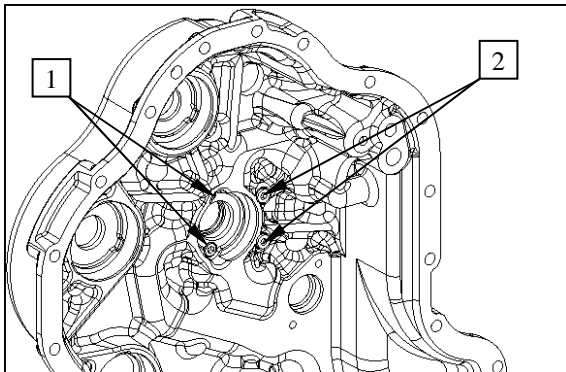


Figure 13

4.2 Disassembly of transmission pump

Loosen cylindrical screws (3 and 4) and remove transmission pump.



Pay attention so that the transmission pump does not drop!

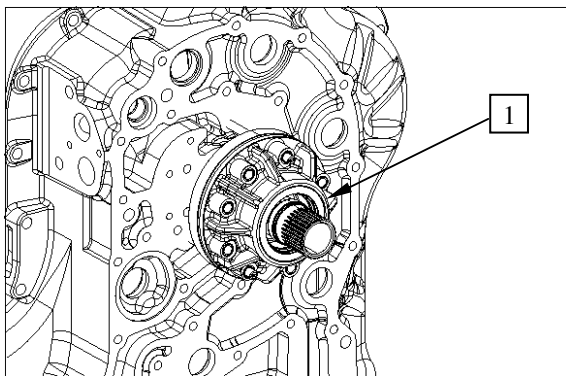


Figure 14

Remove transmission pump (1).

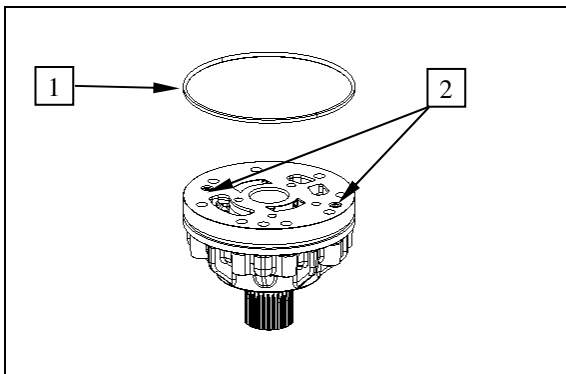


Figure 15

Remove O-ring (1).

Loosen cylindrical screws (2).

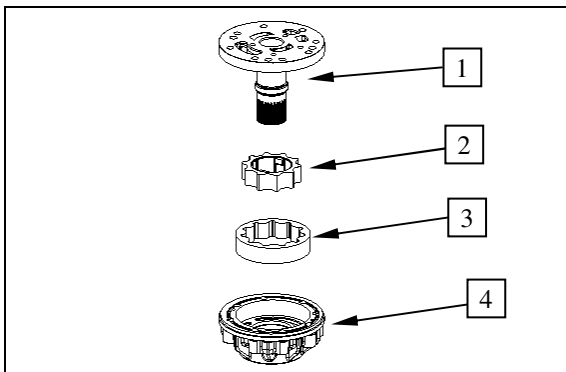


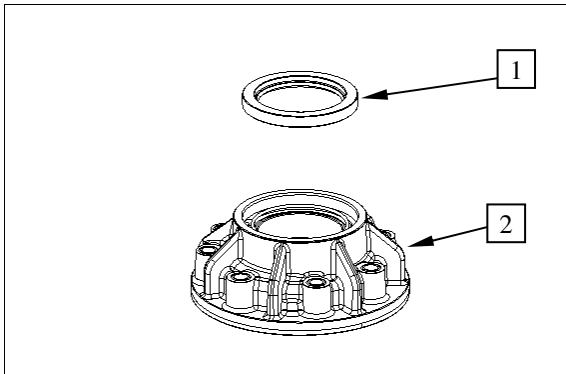
Figure 16



Check transmission pump:

In case of wear marks in the pump housing, stator hollow shaft or on the inner and outer rotor, the complete transmission pump must be replaced.

- 1 = stator hollow shaft
- 2 = inner rotor
- 3 = outer rotor
- 4 = pump housing



Remove shaft seal ring (1) from the pump housing (2).

Figure 17

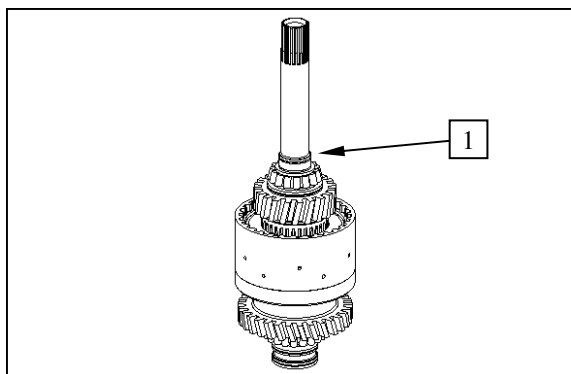


Figure 1

5. Disassembly clutches

5.1 KR clutch/input

Snap out rectangular ring (1).

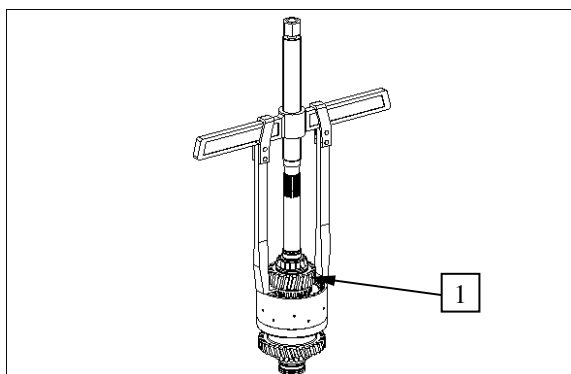


Figure 2

Pull off bearing inner ring with inner disk carrier (1).

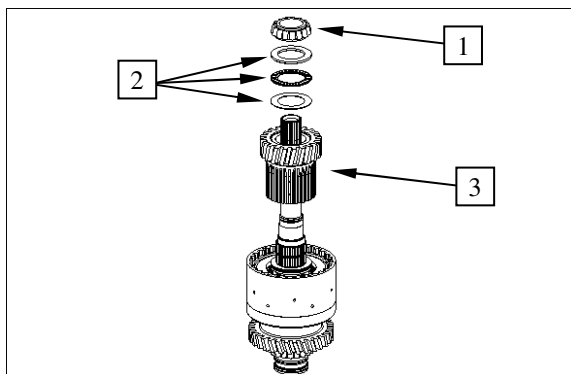


Figure 3

Remove bearing inner ring (1), axial bearing assy (2) and inner disk carrier (3).

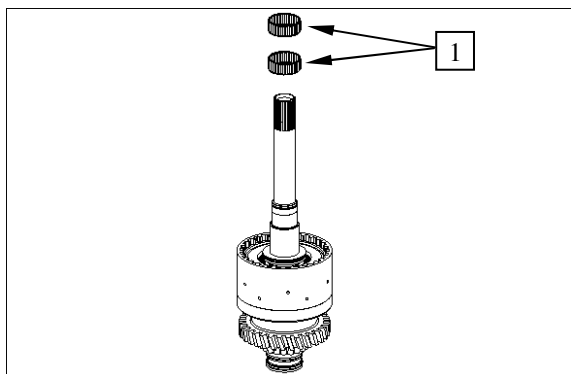


Figure 4

Remove needle cage (1).

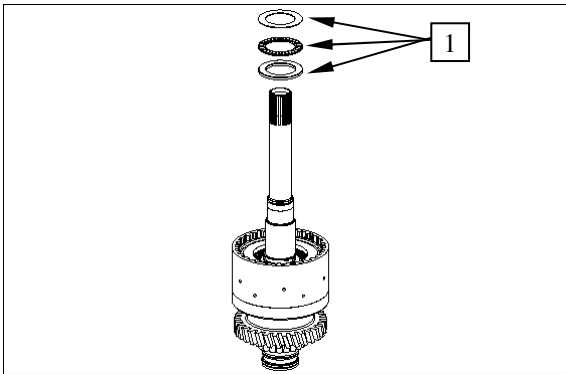


Figure 5

Remove axial bearing assy (1).

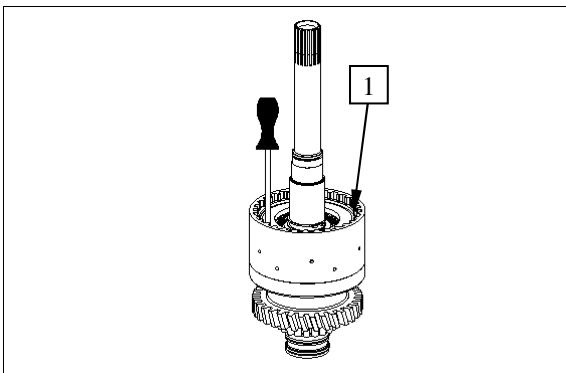


Figure 6

Remove snap ring (1).

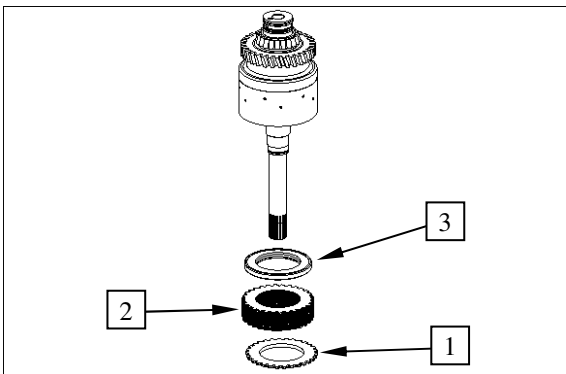


Figure 7

Remove end plate (1), disk package (2) and plate assy with cup springs (3) from the disk carrier.

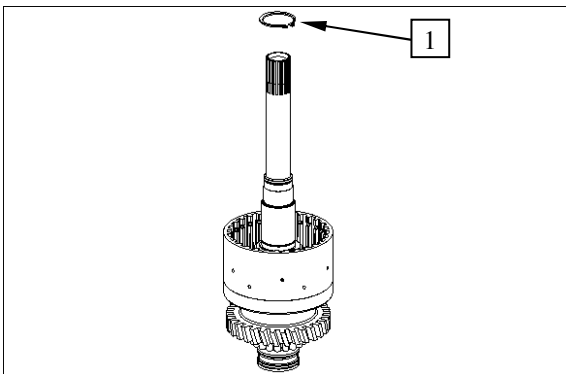


Figure 8

Remove retaining ring (1) at axial bearing contact.

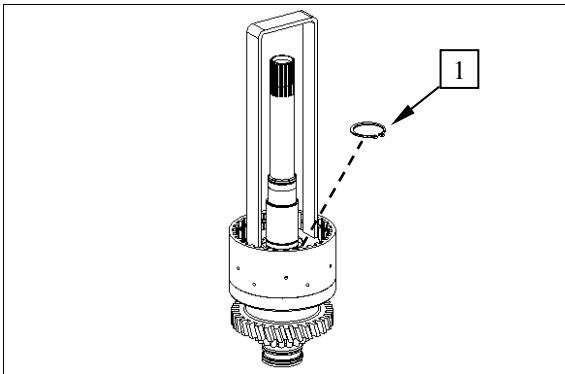


Figure 9

Preload compression spring and remove snap ring (1).

(S) Assembly aid 5870 345 114

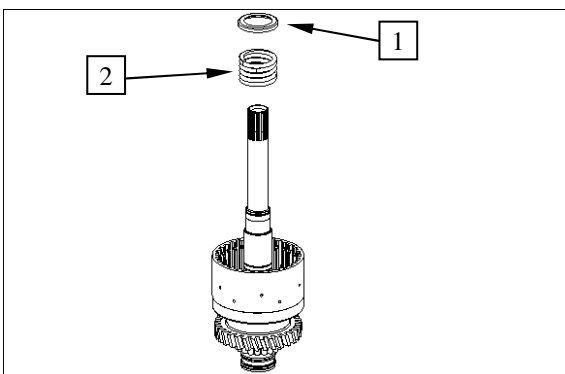


Figure 10

Remove spring cup (1) and compression spring (2).

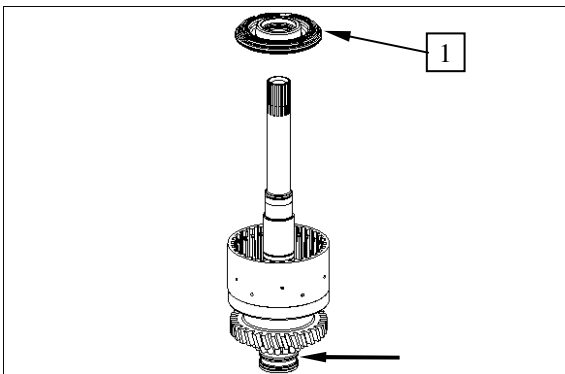


Figure 11

By means of compressed air (see arrow), press piston (1) off the shaft/disk carrier and remove it.

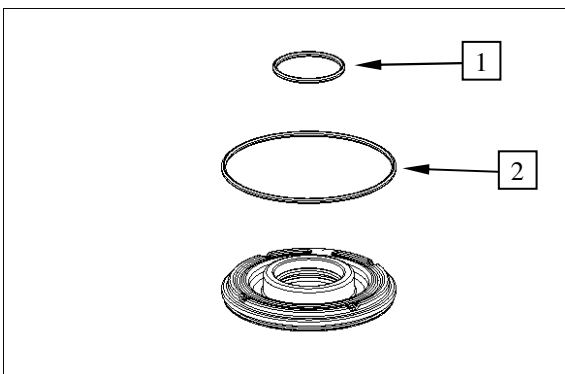


Figure 12

Remove both O-rings (1 and 2).

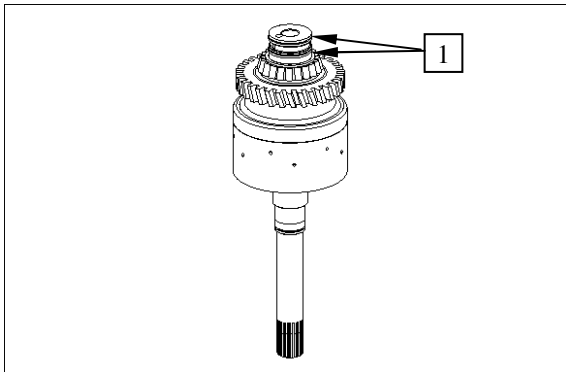


Figure 13

Snap out rectangular rings (1).

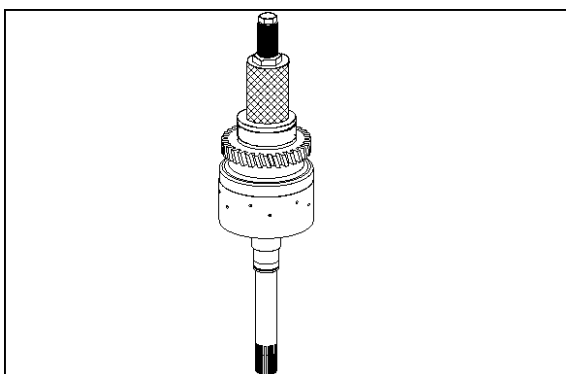


Figure 14

Pull tapered roller bearing (inner ring) off the shaft.

(S) Grab sleeve	5873 001 026
(S) Basic tool	5873 001 000

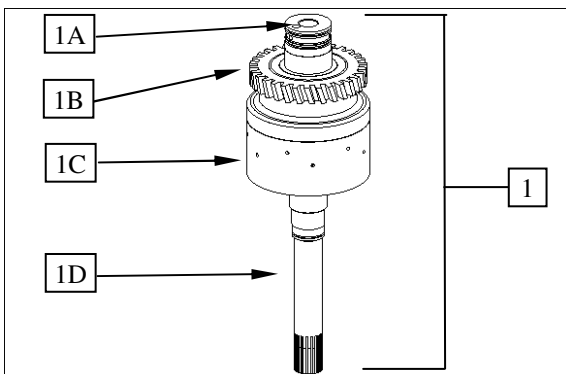


Figure 15

✋ The input shaft (1) cannot be disassembled!
It is supplied by the spare parts service only as a complete
assy which consists of:

1A	=	Ball
1B	=	Helical gear
1C	=	Disk carrier
1D	=	Input shaft

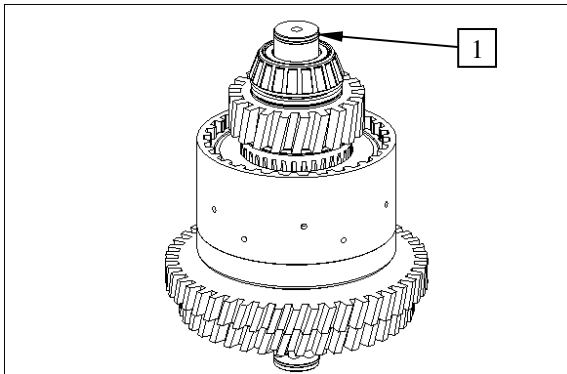


Figure 1

5.2 KV Clutch

Snap out rectangular ring (1).

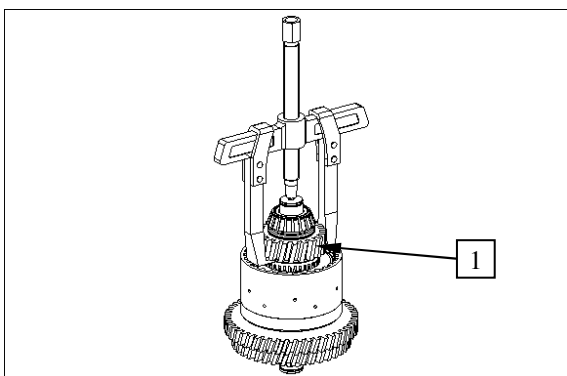


Figure 2

Pull off bearing inner ring with inner disk carrier (1).

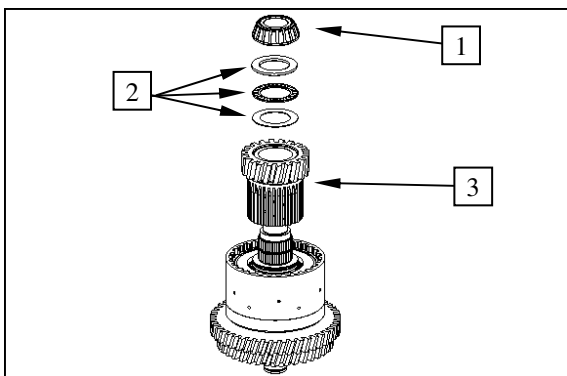


Figure 3

Remove bearing inner ring (1), axial bearing assy (2) and inner disk carrier (3).

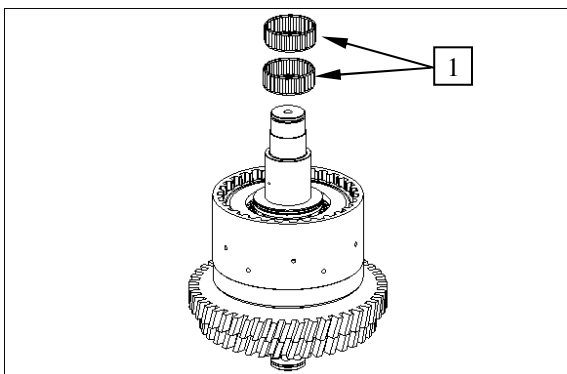


Figure 4

Remove needle cage (1).

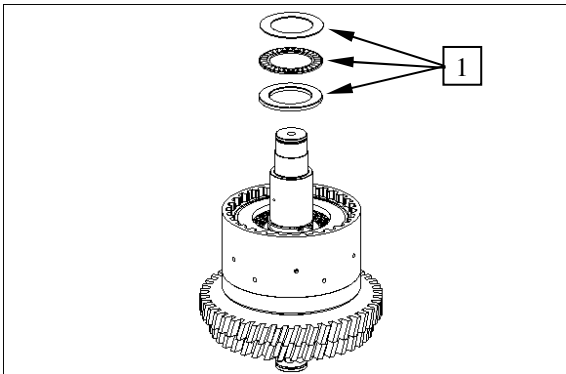


Figure 5

Remove axial bearing assy (1).

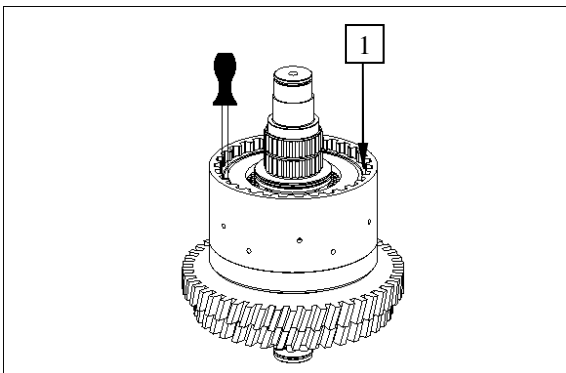


Figure 6

Remove snap ring (1).

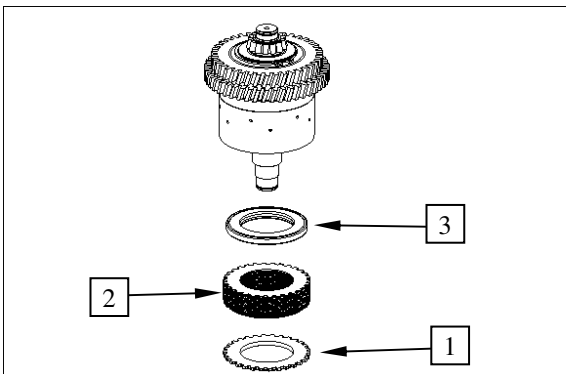


Figure 7

Remove end plate (1), disk package (2) and plate assy with cup springs (3) from the disk carrier.

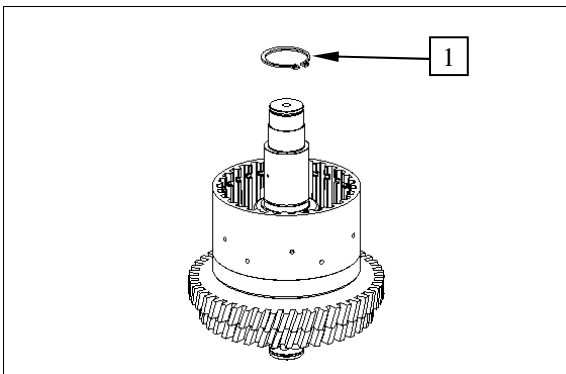


Figure 8

Remove retaining ring (1) at axial bearing contact.

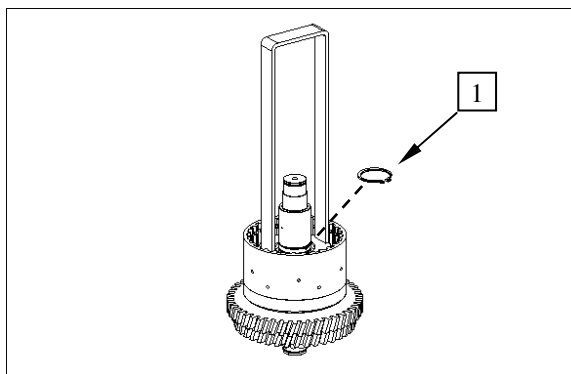


Figure 9

Preload compression spring and remove snap ring (1).

(S) Assembly aid 5870 345 114

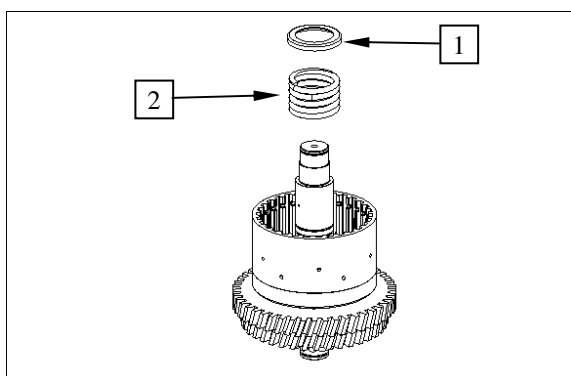


Figure 10

Remove spring cup (1) and compression spring (2).

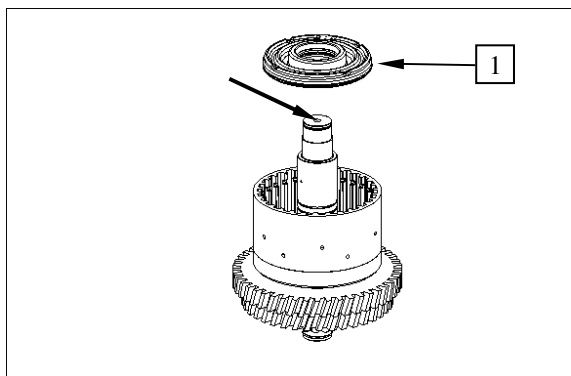


Figure 11

By means of compressed air (see arrow), press piston (1) off the shaft/disk carrier and remove it.

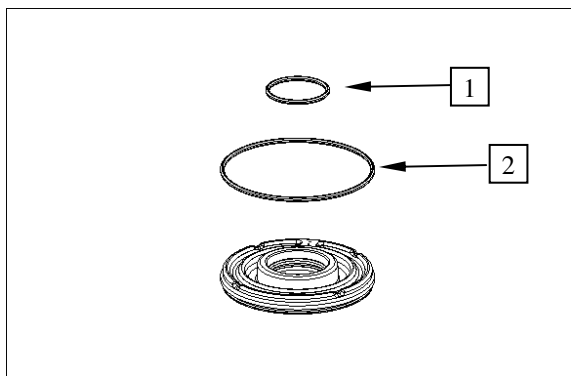


Figure 12

Remove both O-rings (1 and 2).

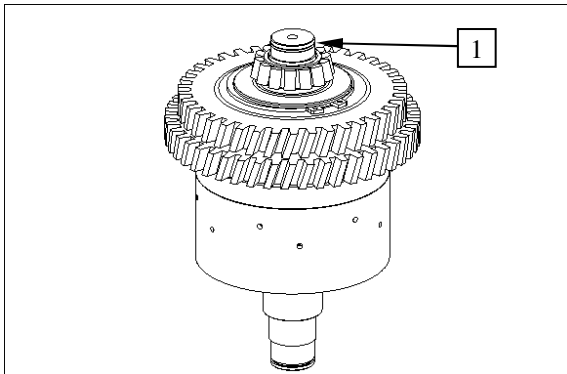


Figure 13

Snap out rectangular ring (1).

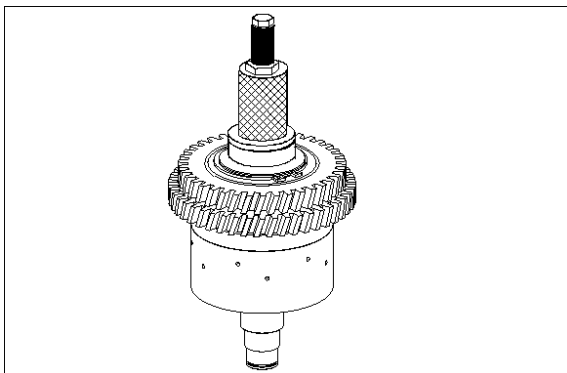


Figure 14

Pull tapered roller bearing (inner ring) off the shaft.

(S) Grab sleeve	5873 000 029
(S) Basic tool	5873 000 001

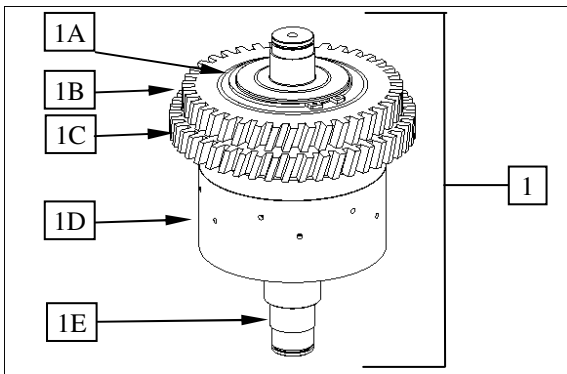


Figure 15



The clutch (1) cannot be disassembled!

It is supplied by the spare parts service only as a complete assy which consists of:

1A	=	Retaining ring
1B	=	Helical gear
1C	=	Helical gear
1D	=	Disk carrier
1E	=	Shaft

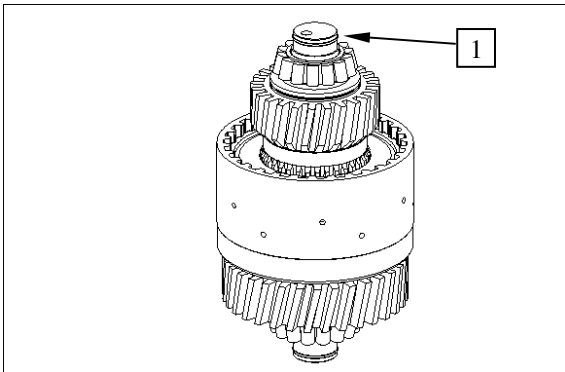


Figure 1

5.3 K1 Clutch

Snap out rectangular ring (1).

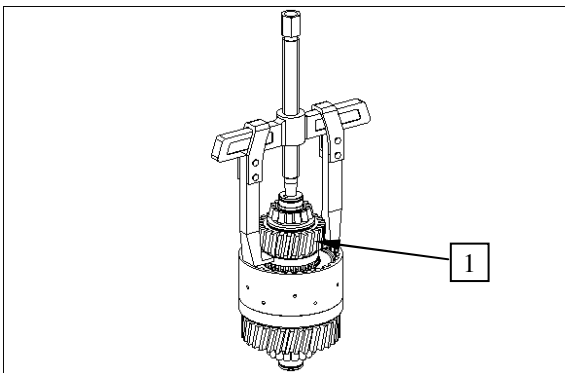


Figure 2

Pull off bearing inner ring with inner disk carrier (1).

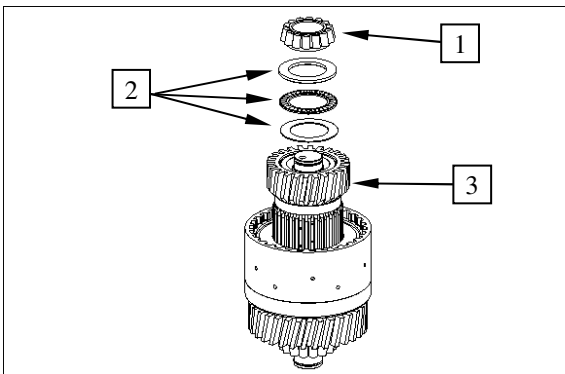


Figure 3

Remove bearing inner ring (1), axial bearing assy (2) and inner disk carrier (3).

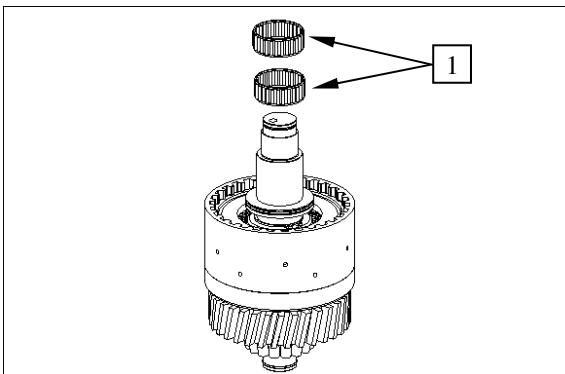


Figure 4

Remove needle cage (1).

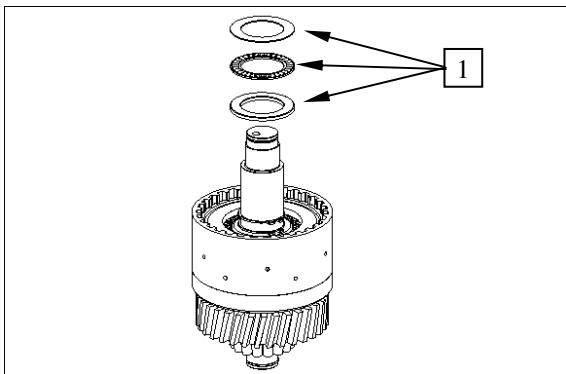


Figure 5

Remove axial bearing assy (1).

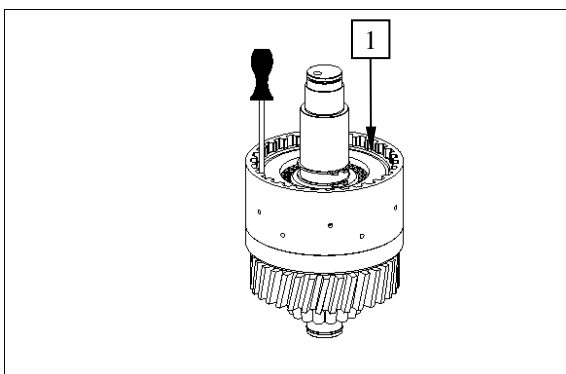


Figure 6

Remove snap ring (1).

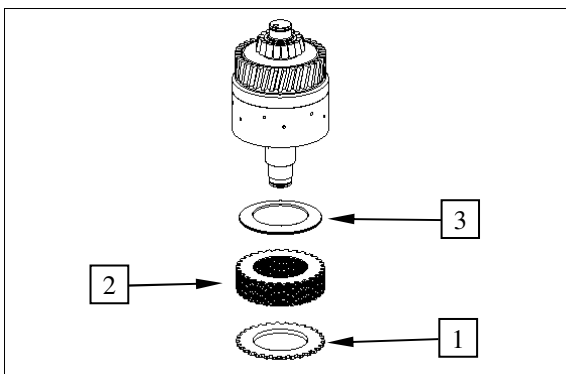


Figure 7

Remove end plate (1), disk package (2) and cup springs (3) from the disk carrier.

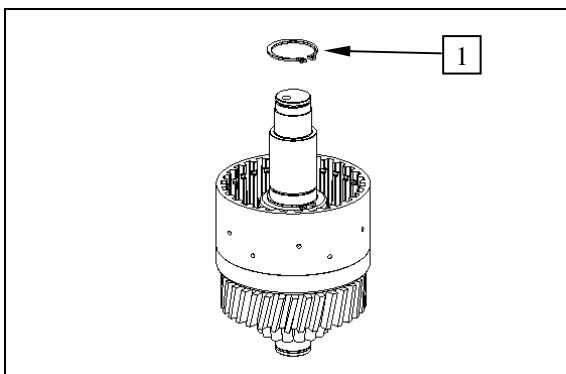


Figure 8

Remove retaining ring (1) at axial bearing contact.

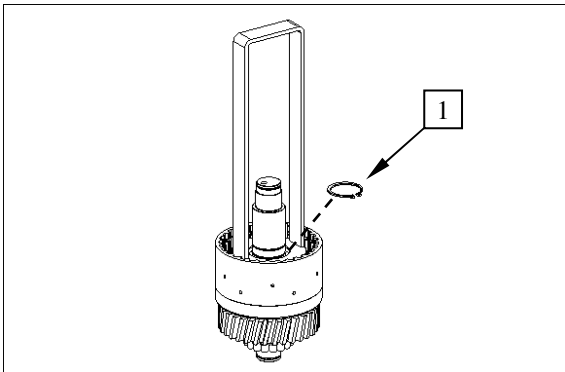


Figure 9

Preload compression spring and remove snap ring (1).

(S) Assembly aid 5870 345 114

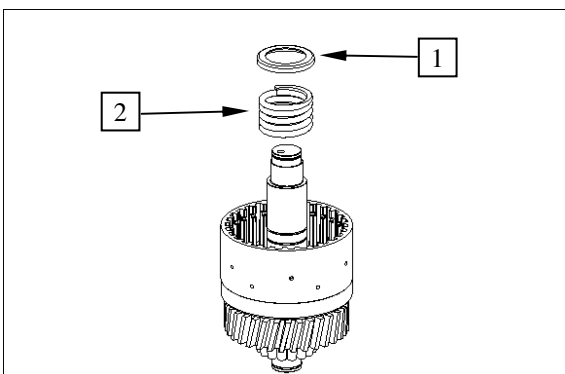


Figure 10

Remove spring cup (1) and compression spring (2).

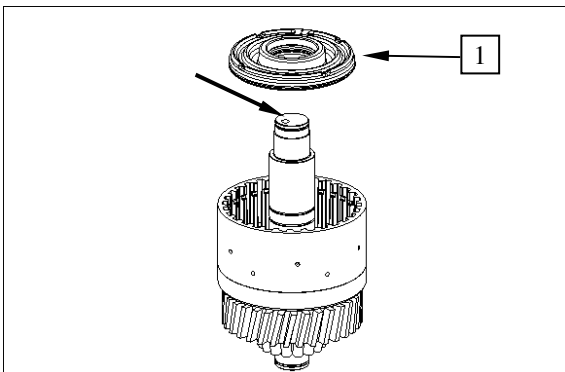


Figure 11

By means of compressed air (see arrow), press piston (1) off the shaft/disk carrier and remove it.

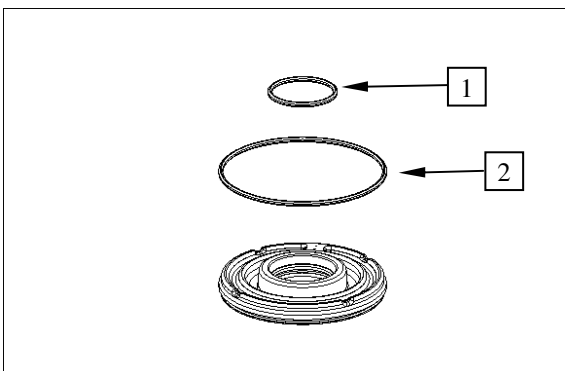


Figure 12

Remove both O-rings (1 and 2).

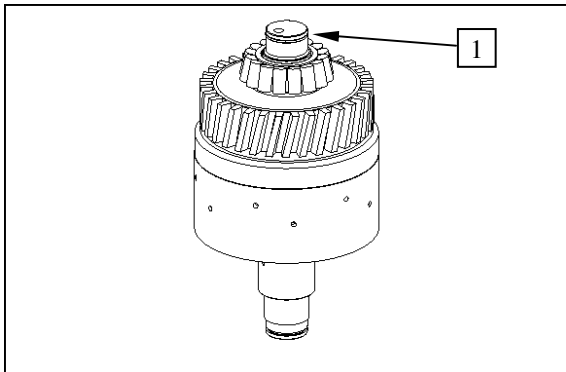


Figure 13

Snap out rectangular ring (1).

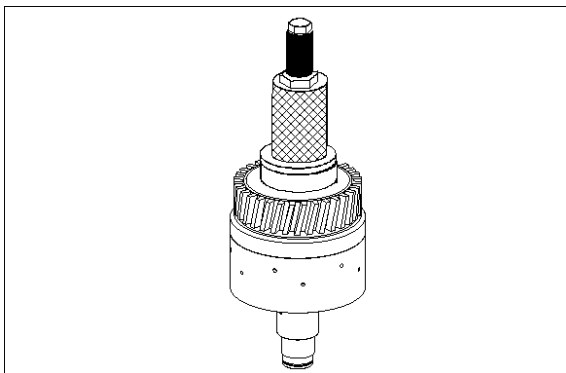


Figure 14

Pull tapered roller bearing (inner ring) off the shaft.

(S) Grab sleeve	5873 011 011
(S) Basic tool	5873 001 000

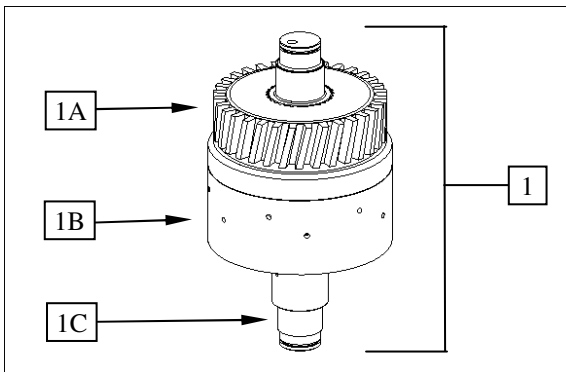


Figure 15



The clutch (1) cannot be disassembled!

It is supplied by the spare parts service only as a complete assy which consists of:

1A	= Helical gear
1B	= Disk carrier
1C	= Shaft

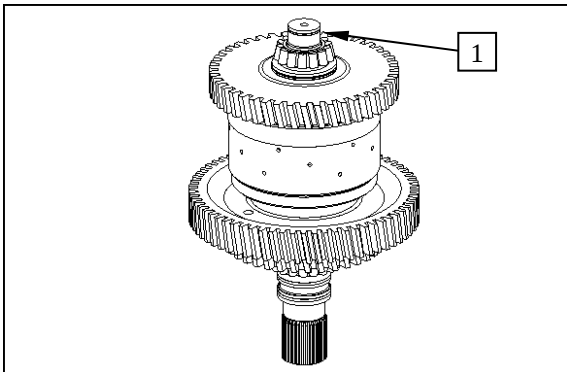


Figure 1

5.4 K2 Clutch

5.4.1 Version 4 WG-94

Disengage rectangular ring (1).

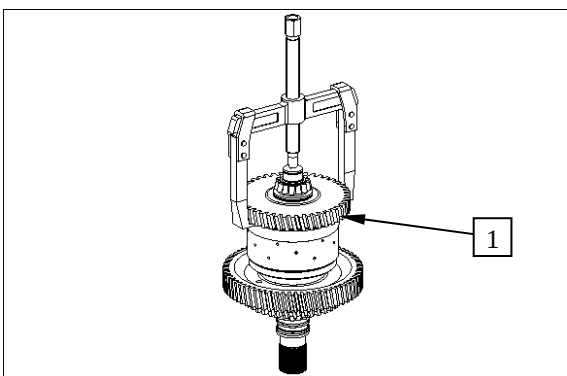


Figure 2

Pull off bearing inner ring with inner disk carrier (1).

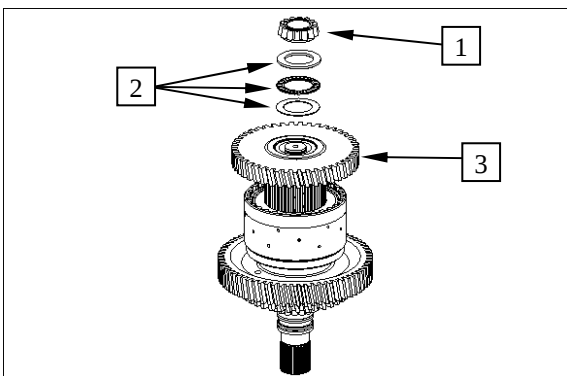


Figure 3

Remove bearing inner ring (1), axial bearing assy (2) and inner disk carrier (3).

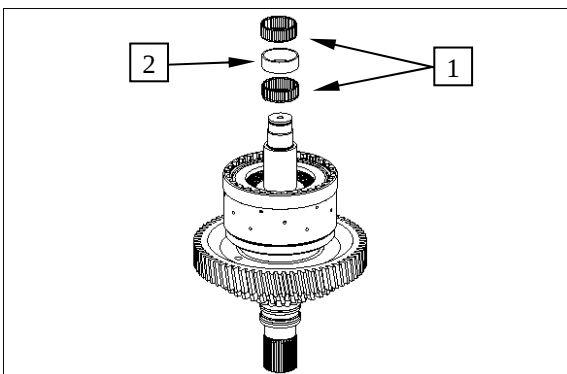


Figure 4

Remove needle cage (1) and bushing (2).

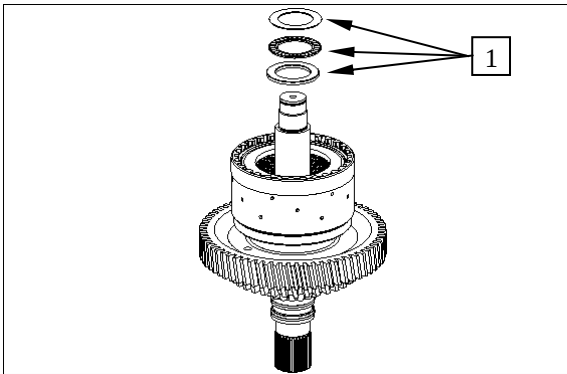


Figure 5

Remove axial bearing assy (1).

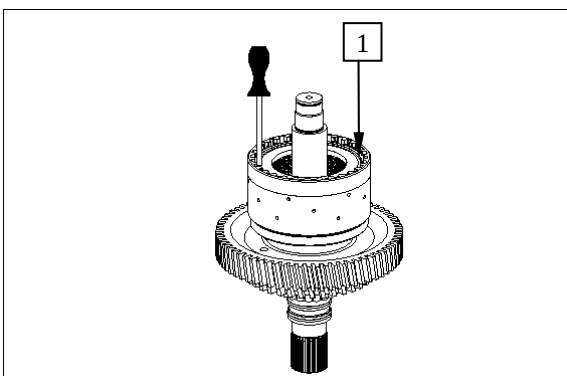


Figure 6

Disengage snap ring (1).

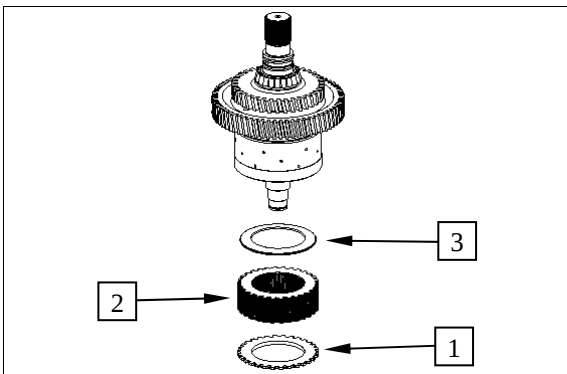


Figure 7

Remove end plate (1), disk package (2) and cup springs (3) from the disk carrier.

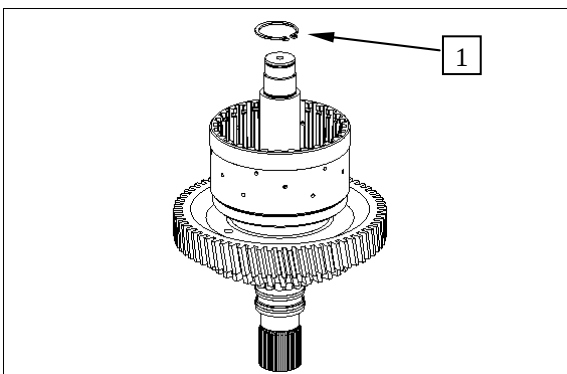


Figure 8

Remove retaining ring at axial bearing contact (1).

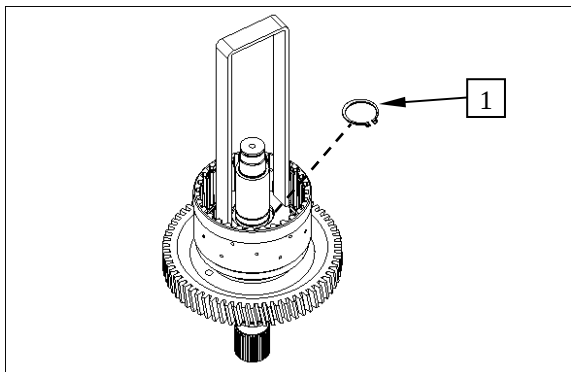


Figure 9

Preload cup springs and remove snap ring (1).

(S) Assembly aid 5870 345 114

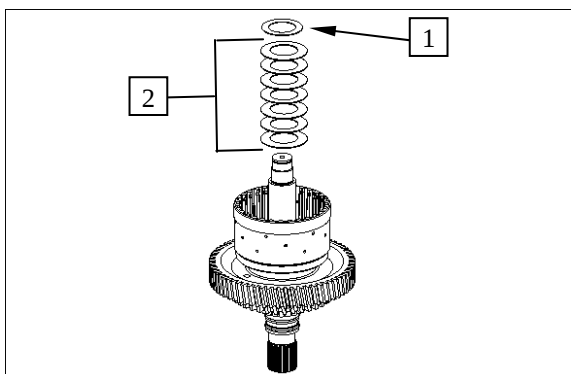


Figure 10

Remove axial washer (1) and cup springs (2).

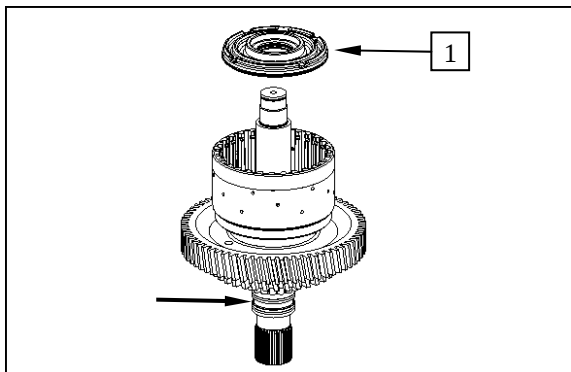


Figure 11

By means of compressed air (see arrow), press piston (1) off the shaft/disk carrier and remove it.

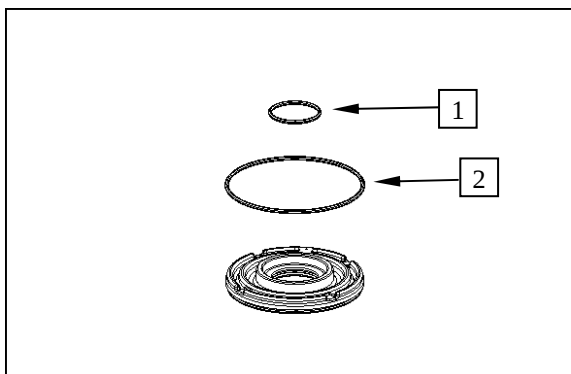


Figure 12

Remove both O-rings (1 and 2).

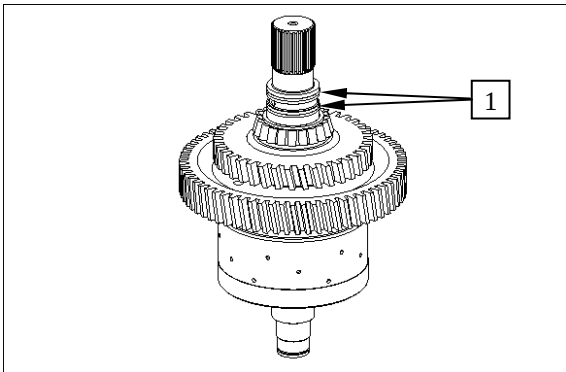


Figure 13

Disengage rectangular rings (1).

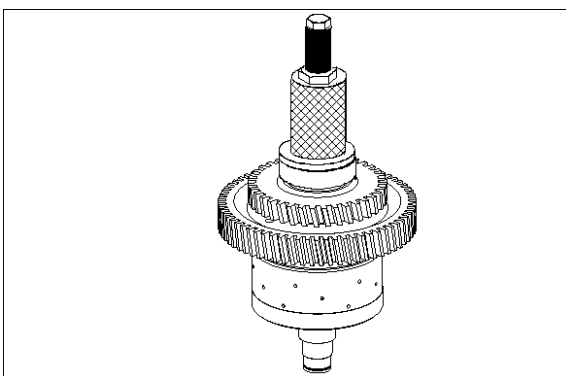


Figure 14

Pull tapered roller bearing (inner ring) off the shaft.

(S) Grab sleeve	5873 001 026
(S) Basic tool	5873 001 000

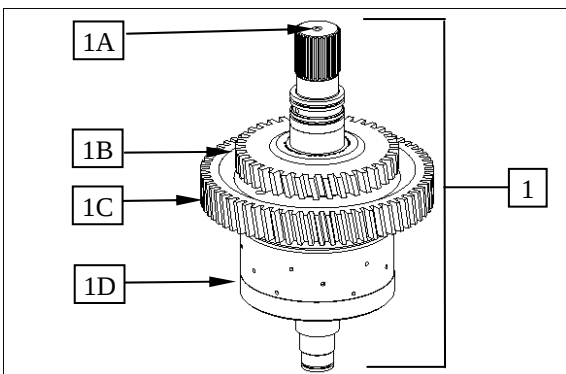


Figure 15



The clutch (1) cannot be disassembled!
It is supplied by the spare parts service only as a complete
assy which consists of:

1A	=	Ball
1B	=	Helical gear
1C	=	Shaft
1D	=	Disk carrier

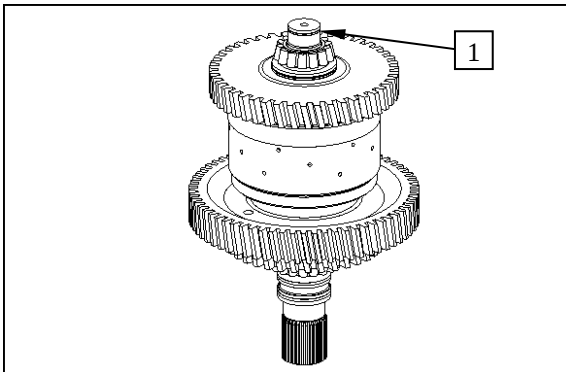


Figure 16

5.4.2 Version 5 WG-94

Disengage rectangular ring (1).

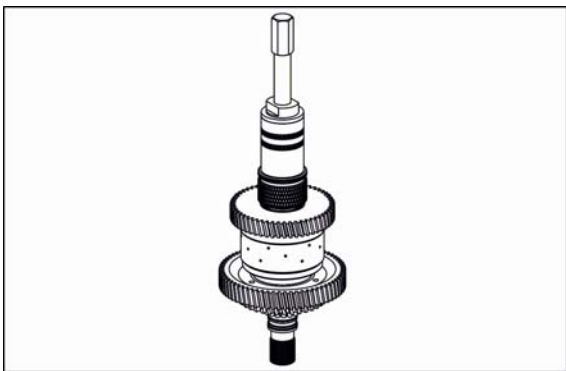


Figure 17

Pull tapered roller bearing (inner ring) off the shaft.

(S) Grab sleeve	5873 000 029
(S) Basic tool	5873 000 001

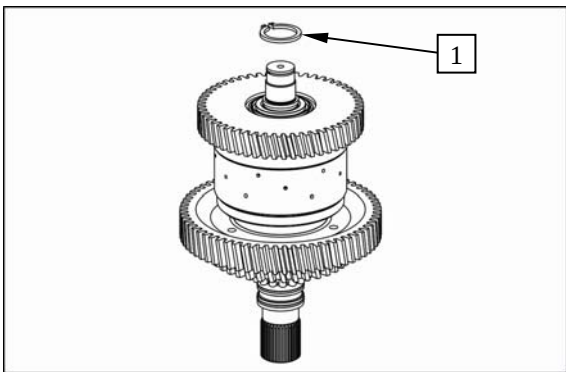


Figure 18

Disengage retaining ring (1).

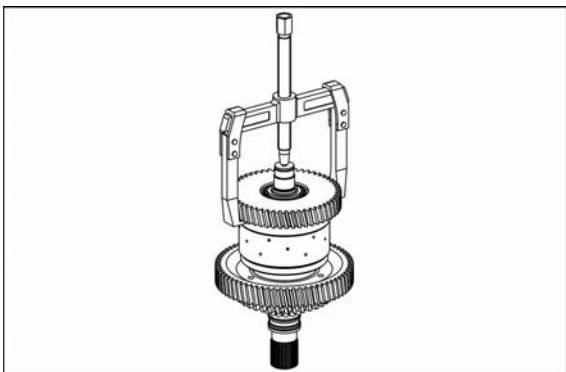


Figure 19

Pull off bearing inner ring with inner disk carrier (1).

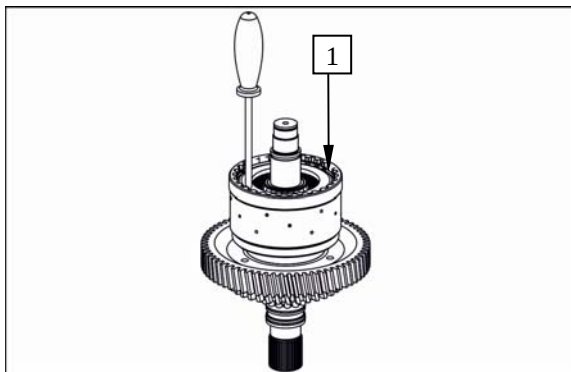


Figure 20

Disengage snap ring (1).

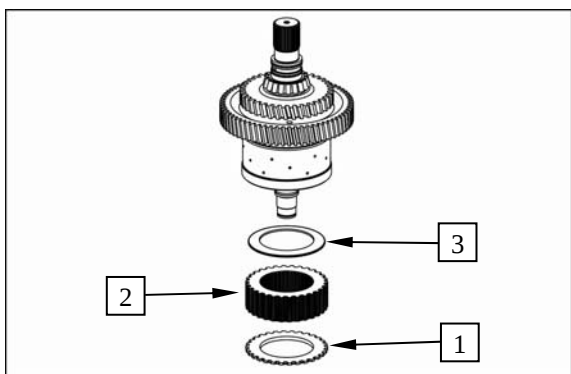


Figure 21

Remove end plate (1), disk package (2) and cup springs (3) from the disk carrier.

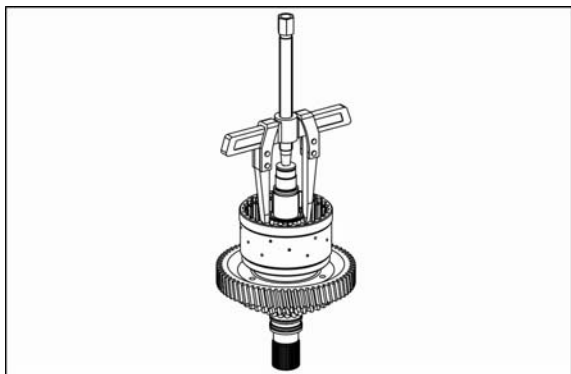


Figure 22

Pull off bearing inner ring (1).

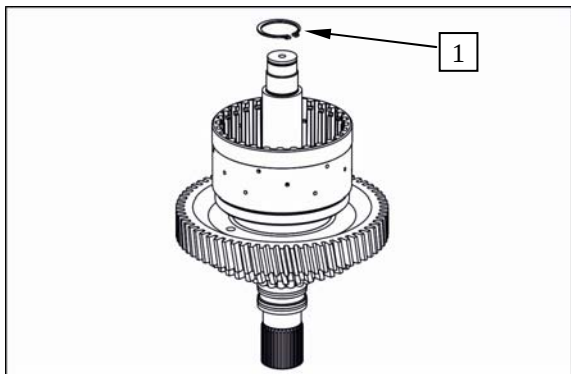


Figure 23

Remove retaining ring (1) at bearing inner ring contact.

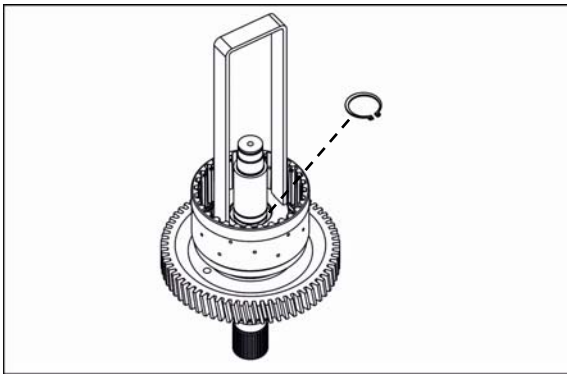


Figure 24

Preload cup springs and disengage snap ring (1).

(S) Assembly aid 5870 345 114

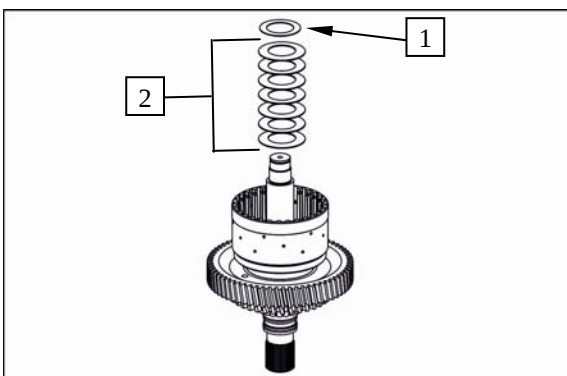


Figure 25

Remove axial washer (1) and cup springs (2).

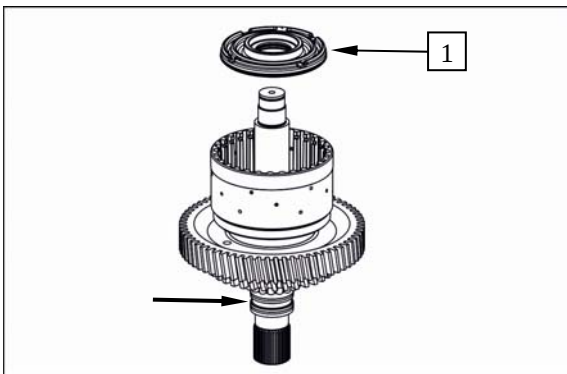


Figure 26

By means of compressed air (see arrow), press piston (1) off the shaft/disk carrier and remove it.

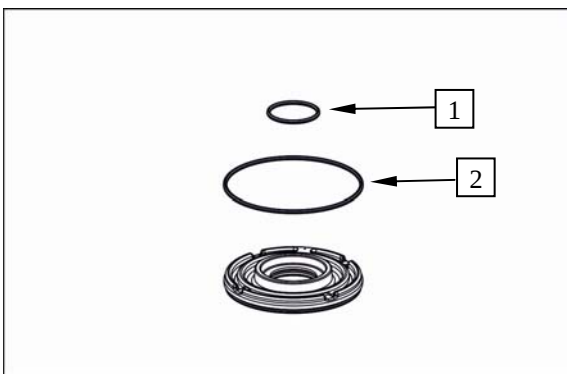


Figure 27

Remove both O-rings (1 and 2).

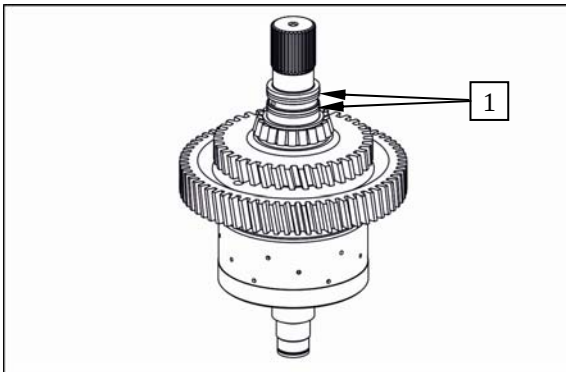


Figure 28

Disengage rectangular rings (1).

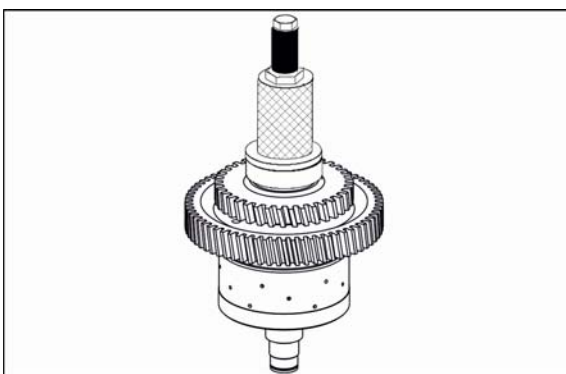


Figure 29

Pull tapered roller bearing (inner ring) off the shaft.

(S) Grab sleeve	5873 001 026
(S) Basic tool	5873 001 000

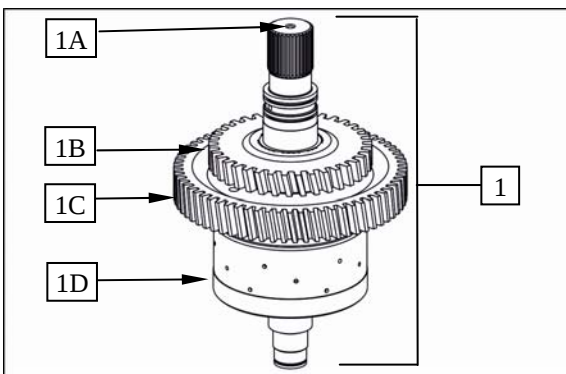


Figure 30



The clutch (1) cannot be disassembled!

It is supplied by the spare parts service only as a complete assy which consists of:

1A	= Ball
1B	= Helical gear
1C	= Shaft
1D	= Disk carrier

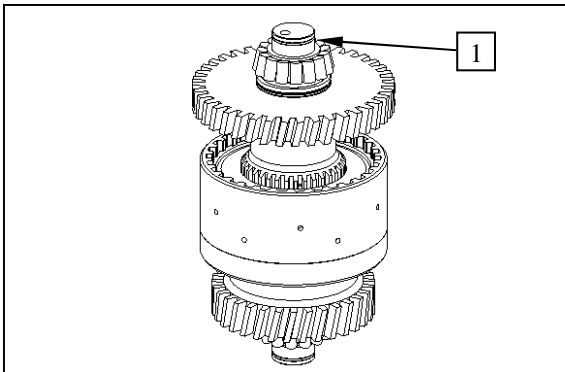


Figure 1

5.5 K3 Clutch

Snap out rectangular ring (1).

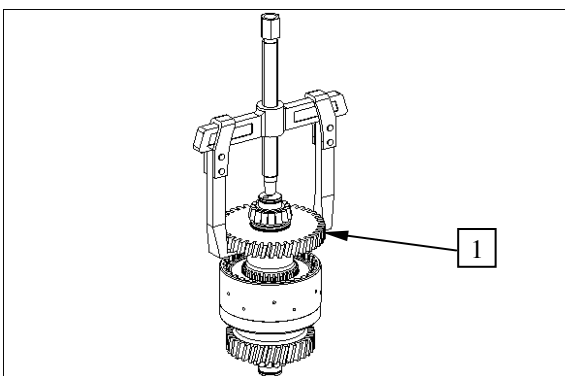


Figure 2

Pull off bearing inner ring with inner disk carrier (1).

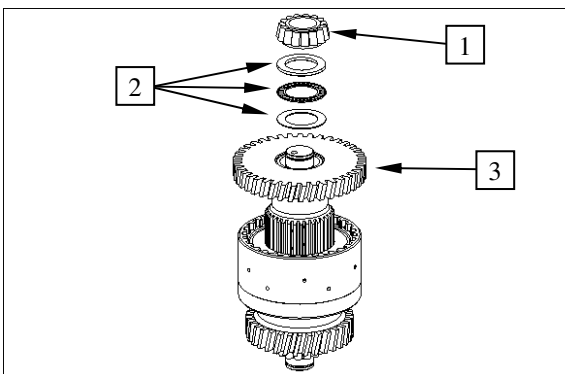


Figure 3

Remove bearing inner ring (1), axial bearing assy (2) and inner disk carrier (3).

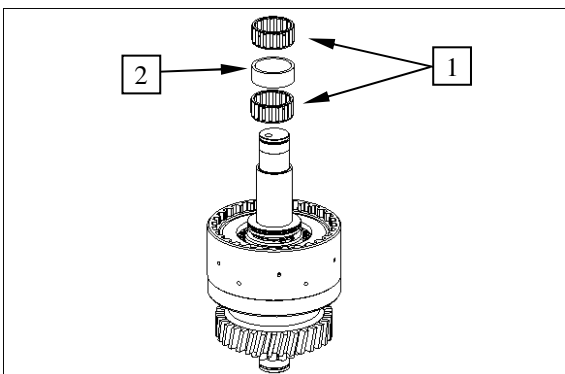


Figure 4

Remove needle cage (1) and bushing (2).

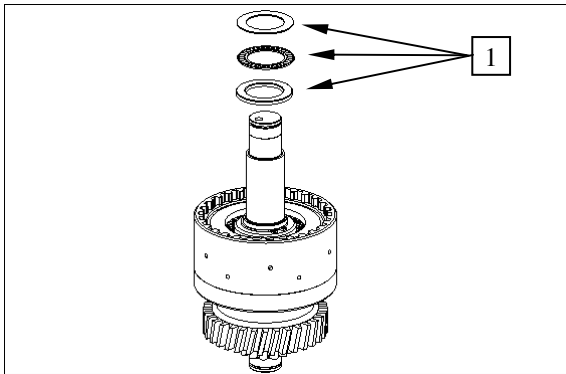


Figure 5

Remove axial bearing assy (1).

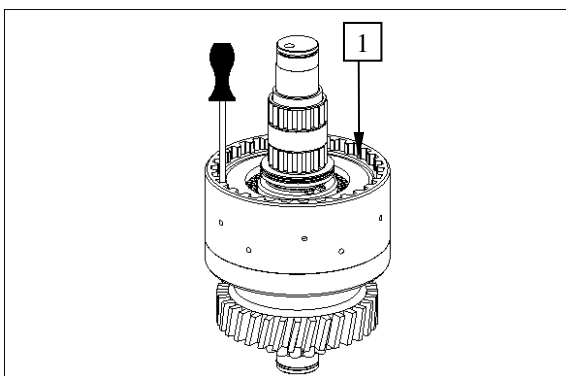


Figure 6

Remove snap ring (1).

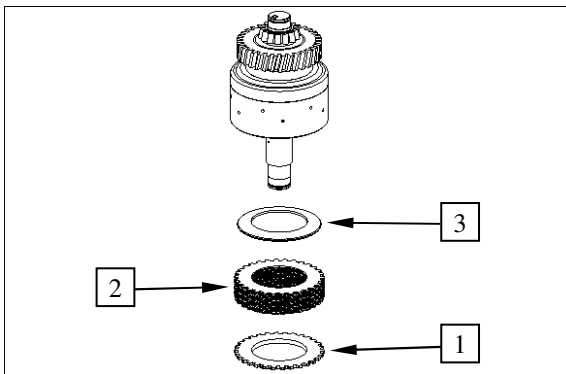


Figure 7

Remove end plate (1), disk package (2) and cup springs (3) from the disk carrier.

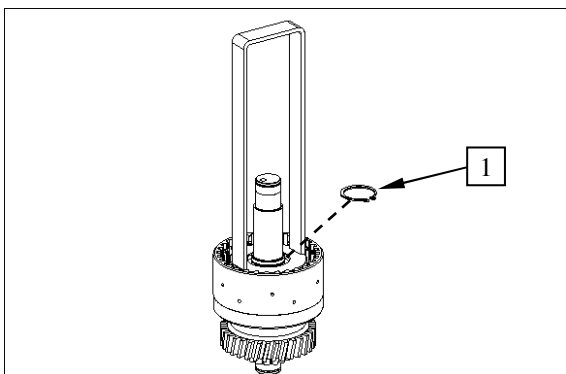


Figure 8

Preload compression spring and remove snap ring (1).

(S) Assembly aid

5870 345 114

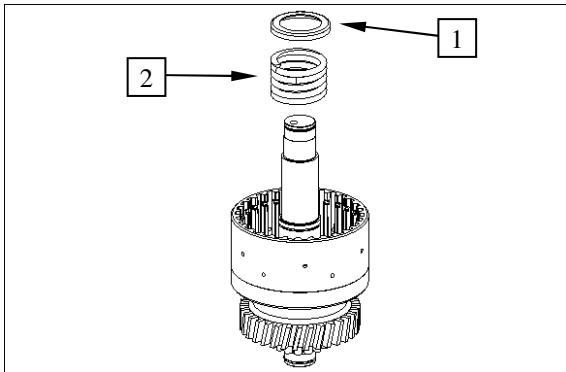


Figure 9

Remove spring cup (1) and compression spring (2).

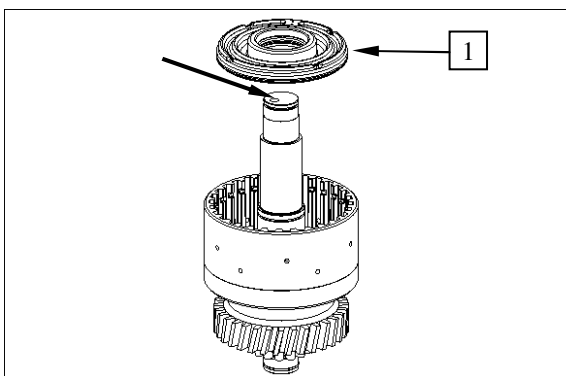


Figure 10

By means of compressed air (see arrow), press piston (1) off the shaft/disk carrier and remove it.

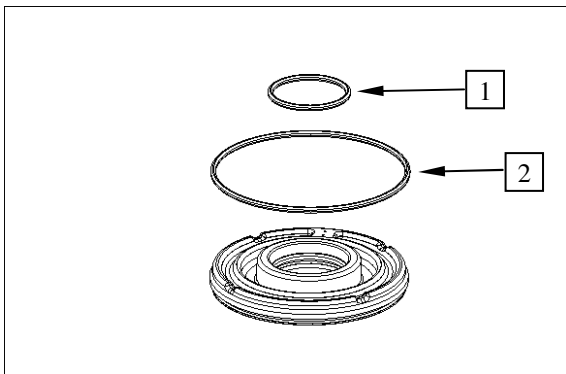


Figure 11

Remove both O-rings (1 and 2).

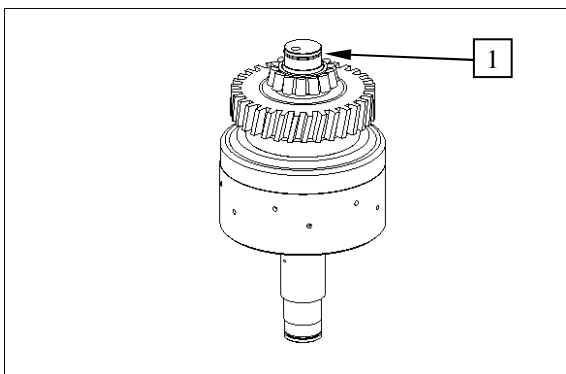


Figure 12

Snap out rectangular ring (1).

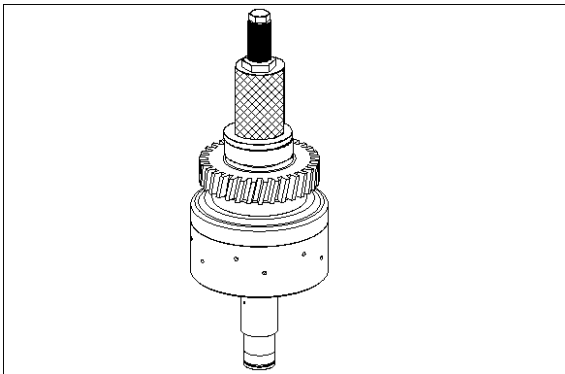


Figure 13

Pull tapered roller bearing (inner ring) off the shaft.

- | | |
|-----------------|--------------|
| (S) Grab sleeve | 5873 000 029 |
| (S) Basic tool | 5873 000 001 |

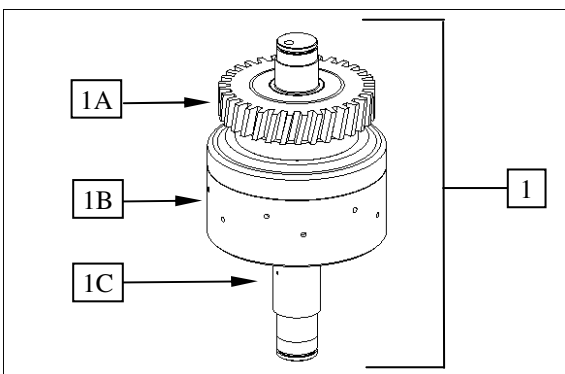


Figure 14

 **The clutch (1) cannot be disassembled!**
It is supplied by the spare parts service only as a complete
assy which consists of:

- 1A = Helical gear
- 1B = Shaft
- 1C = Disk carrier

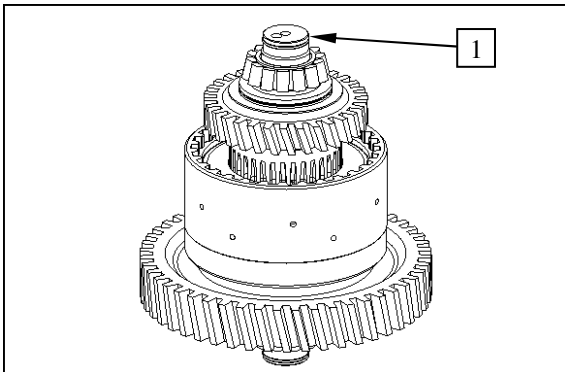


Figure 1

5.6 K4 Clutch

Snap out rectangular ring (1).

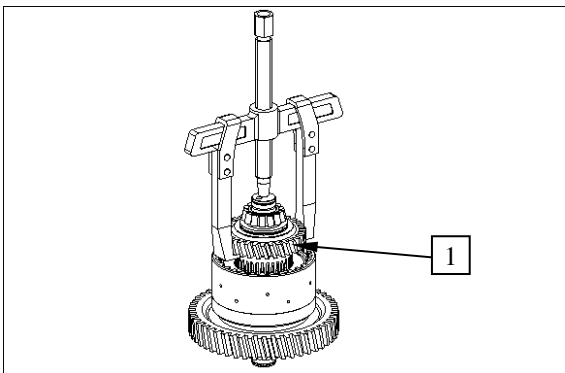


Figure 2

Pull off bearing inner ring with inner disk carrier (1).

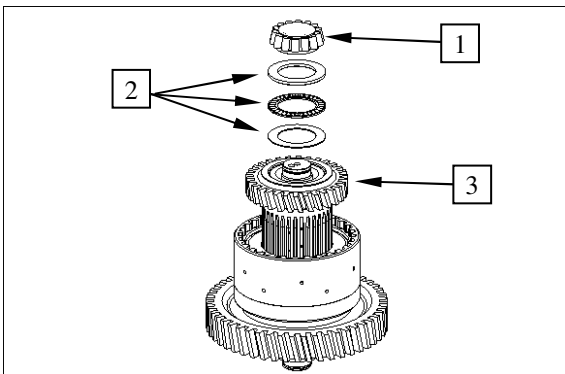


Figure 3

Remove bearing inner ring (1), axial bearing assy (2) and inner disk carrier (3).

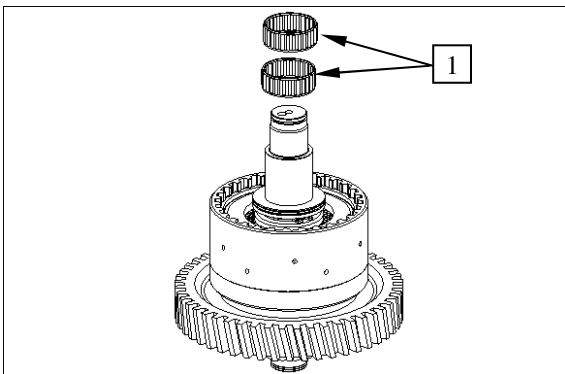


Figure 4

Remove needle cage (1).

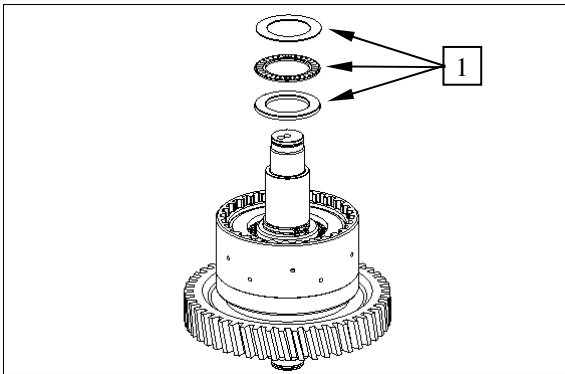


Figure 5

Remove axial bearing assy (1).

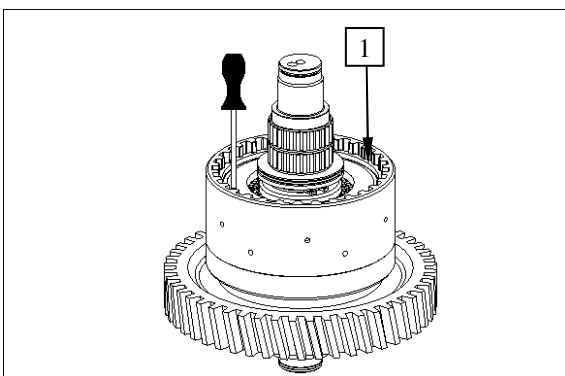


Figure 6

Remove snap ring (1).

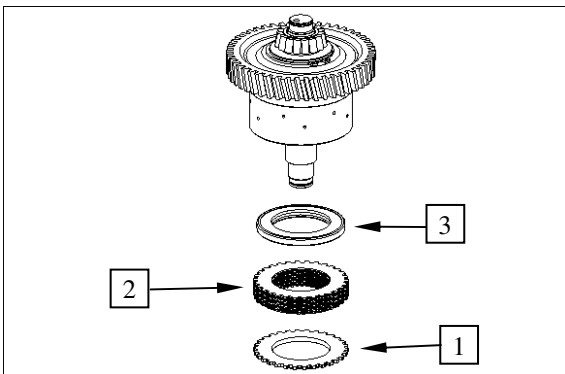


Figure 7

Remove end plate (1), disk package (2) and plate assy with cup springs (3) from the disk carrier.

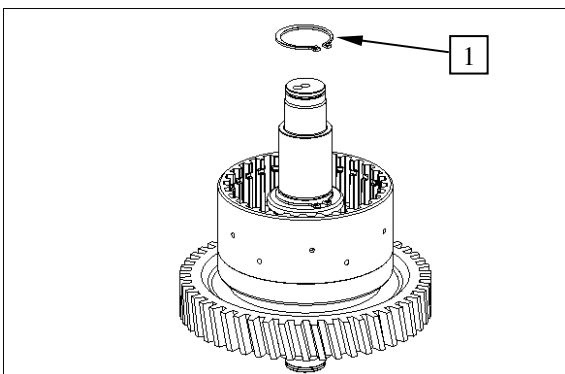


Figure 8

Remove retaining ring (1) at axial bearing contact.

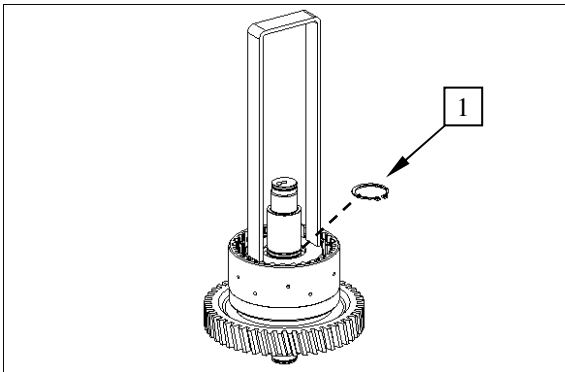


Figure 9

Preload compression spring and remove snap ring (1).

(S) Assembly aid 5870 345 114

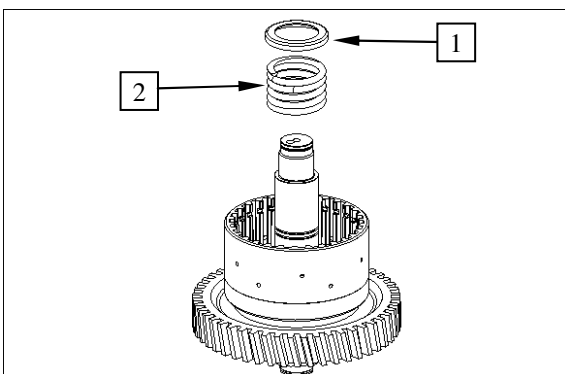


Figure 10

Remove spring cup (1) and compression spring (2).

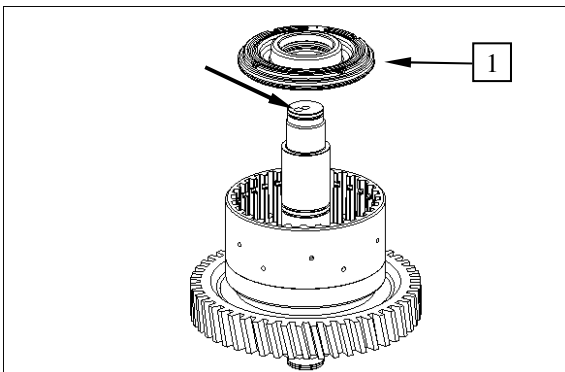


Figure 11

By means of compressed air (see arrow), press piston (1) off the shaft/disk carrier and remove it.

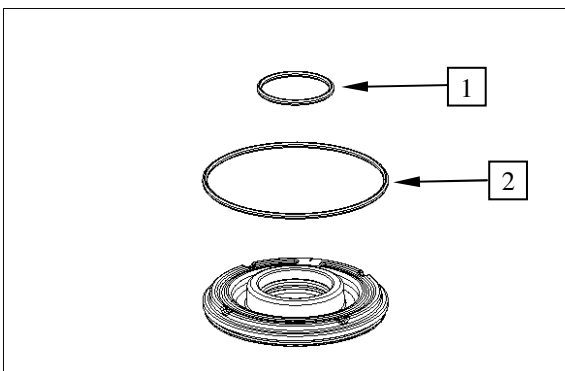


Figure 12

Remove both O-rings (1 and 2).

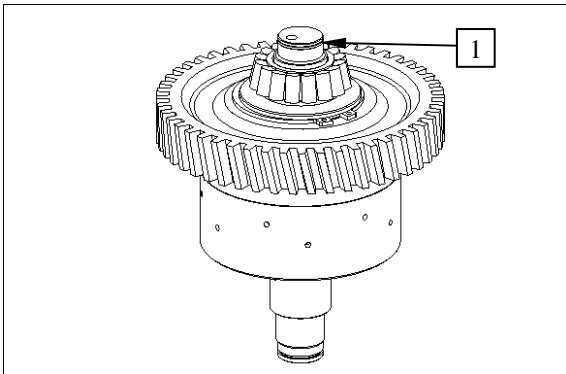


Figure 13

Snap out rectangular ring (1).

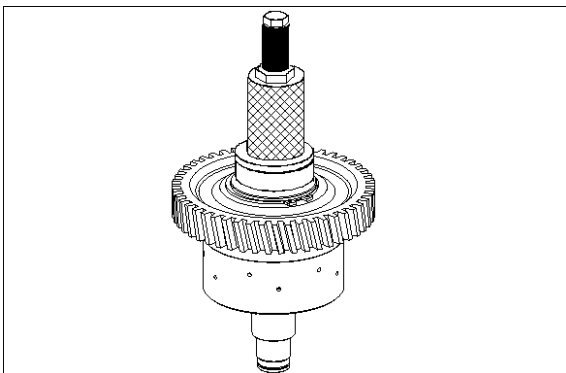


Figure 14

Pull tapered roller bearing (inner ring) off the shaft.

(S) Grab sleeve	5873 011 011
(S) Basic tool	5873 001 000

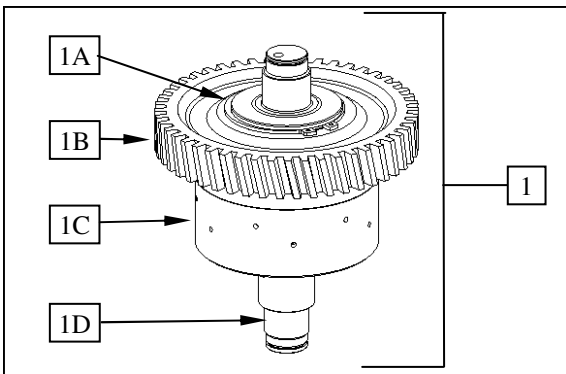


Figure 15



The clutch (1) cannot be disassembled!
It is supplied by the spare parts service only as a complete assy which consists of:

1A	= Retaining ring
1B	= Helical gear
1C	= Disk carrier
1D	= Shaft

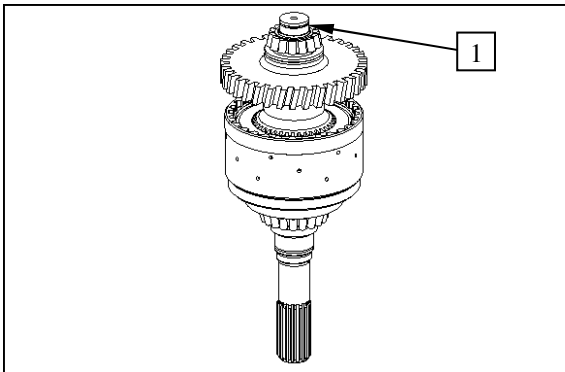


Figure 1

5.7 Front wheel drive (VA)

Snap out rectangular ring (1).

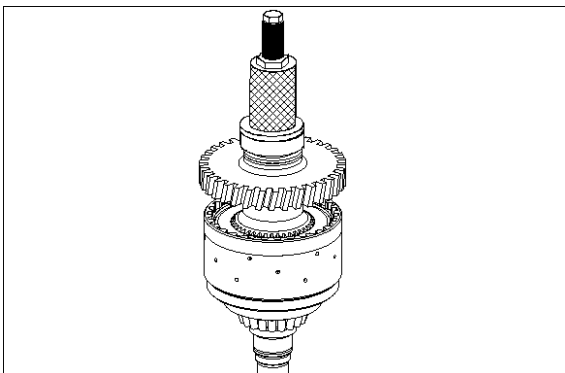


Figure 2

Pull tapered roller bearing (inner ring) off the shaft.

(S) Grab sleeve	5873 000 029
(S) Basic tool	5873 000 001

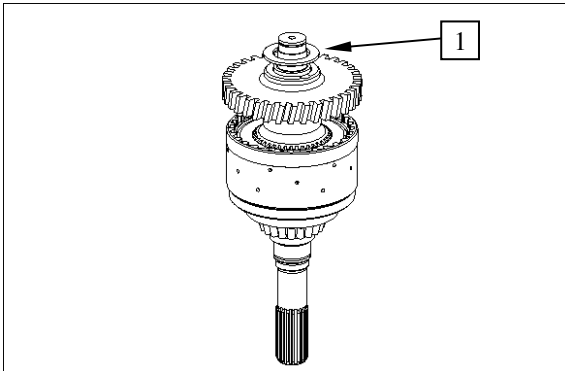


Figure 3

Remove running disk (1).

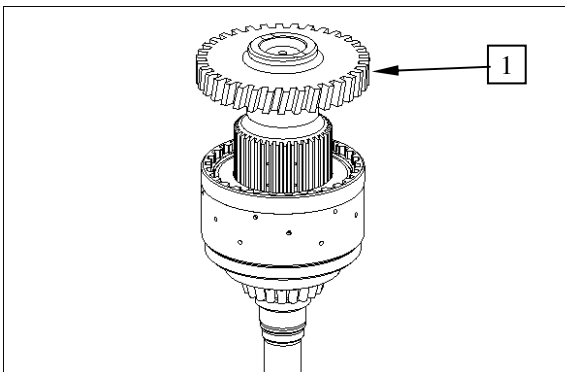


Figure 4

Pull off inner disk carrier (1).

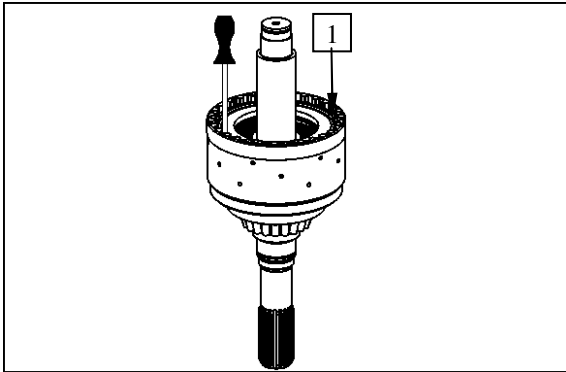


Figure 5

Remove snap ring (1).

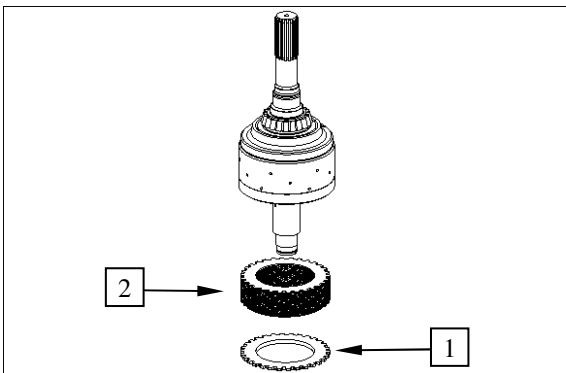


Figure 6

Remove end plate (1) and disk package (2) from the disk carrier.

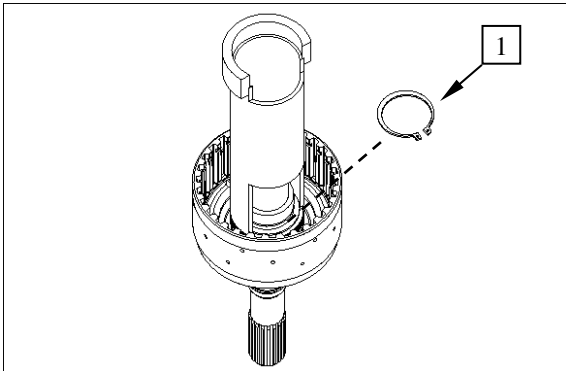


Figure 7

Preload cup springs and remove snap ring (1).

(S) Assembly aid 5870 506 128

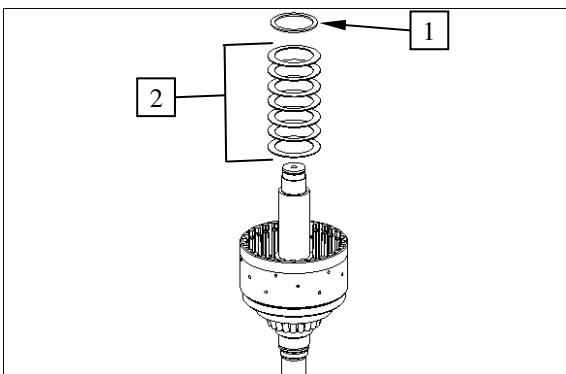


Figure 8

Remove washer (1) and cup springs (2).

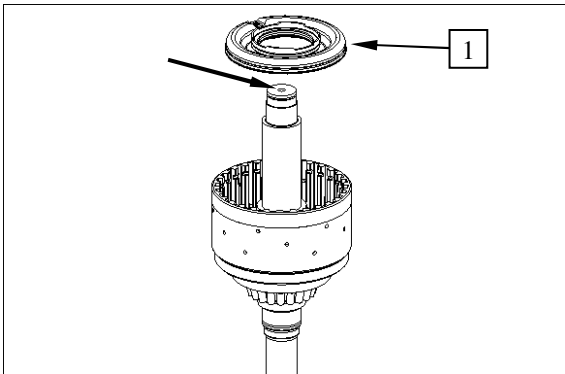


Figure 9

By means of compressed air (see arrow), press piston (1) off the shaft/disk carrier and remove it.

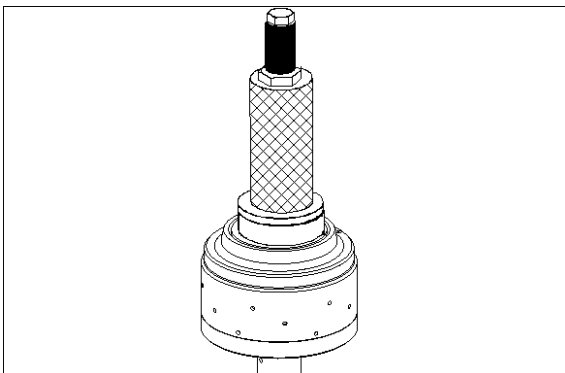


Figure 10

Pull tapered roller bearing (inner ring) off the shaft.

(S) Grab sleeve	5873 001 026
(S) Basic tool	5873 001 000

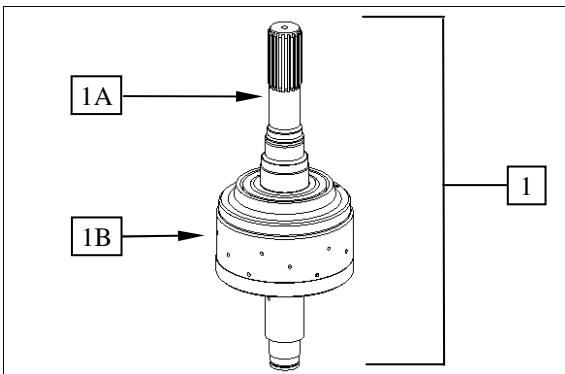


Figure 11



The clutch (1) cannot be disassembled!
It is supplied by the spare parts service only as a complete assy which consists of:

1A = Shaft
1B = Disk carrier

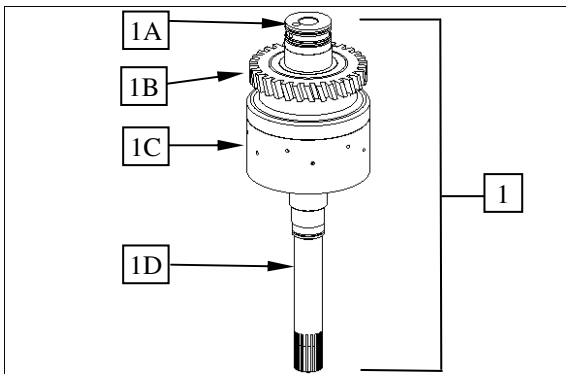


Figure 1

6. Reassembly of clutches:

6.1 KR clutch/input

The input shaft (1) is supplied by the spare parts service only as a complete assy which consists of:

- 1A = Ball
- 1B = Helical gear
- 1C = Disk carrier
- 1D = Input shaft

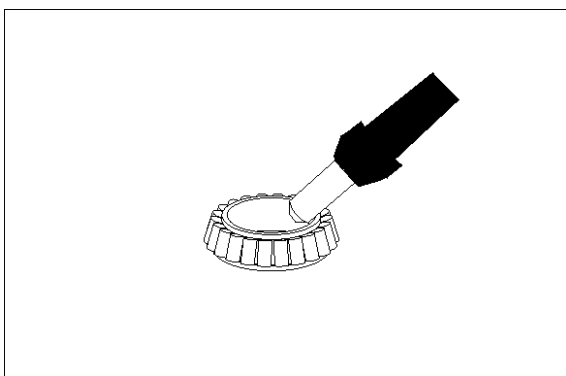


Figure 2

Heat up bearing inner ring (approx. 120° C).

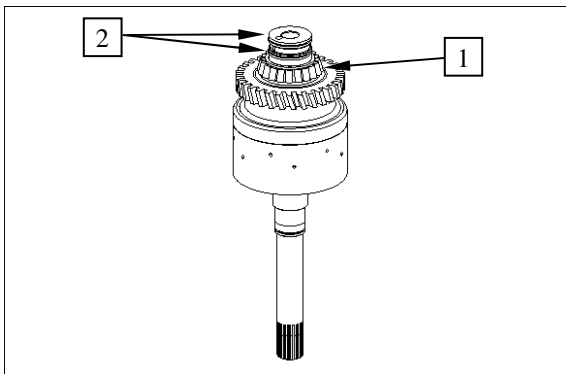


Figure 3

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular rings 50x2.5 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling-down.

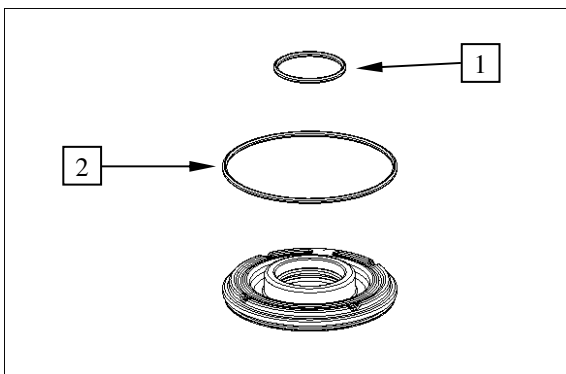


Figure 4

Insert both O-rings (1 and 2) into the piston grooves and oil them.

- 1 = 40x3
- 2 = 104.5x3

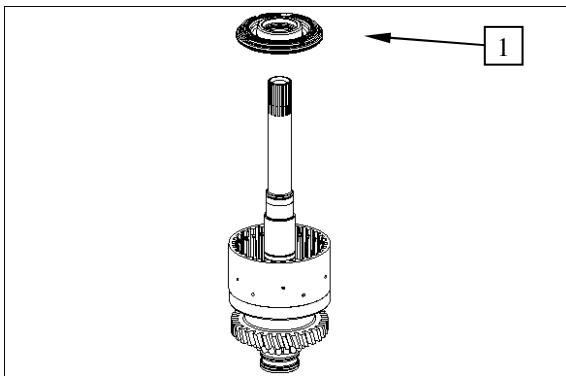


Figure 5

Insert piston (1) into the disk carrier.

 Pay attention to the installation position, see Figure!

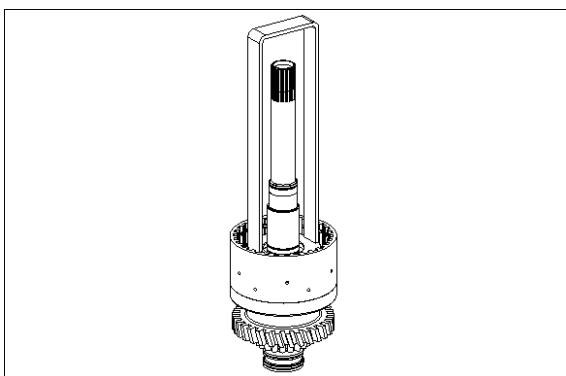


Figure 6

Use a hand-operated press to place piston into the disk carrier by means of the assembly aid.

(S) Assembly aid 5870 345 114

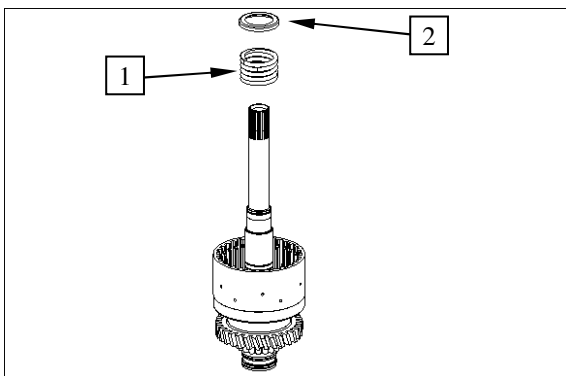


Figure 7

Mount compression spring (1) and spring cup (2).

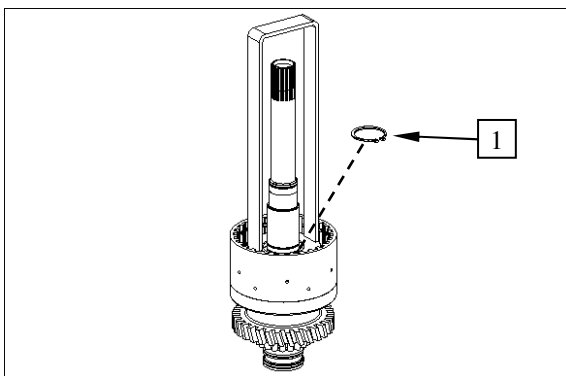


Figure 8

By means of the assembly aid, preload compression spring under a hand-operated press until the retaining ring 40x1.75 (1) can be snapped in.

(S) Assembly aid 5870 345 114

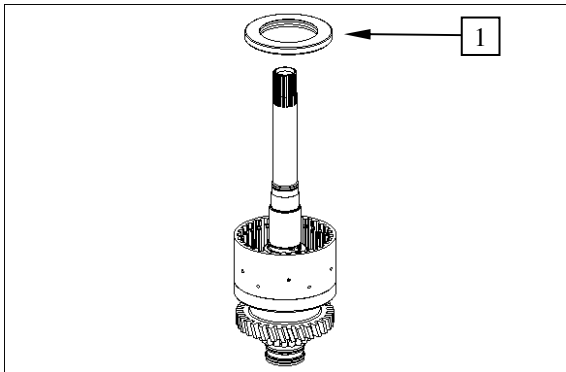


Figure 9

Mount plate assy with cup springs (1), with the open side showing towards the piston.

 **Installation position of plate see also Figure 10!**

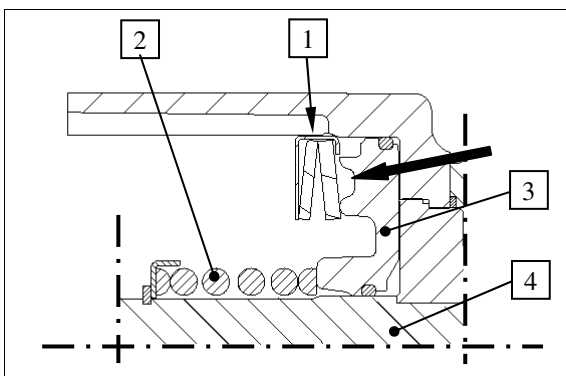


Figure 10

Fit plate (1) according to sketch (see arrow).

Legend:

- 1 = Plate assy with cup springs
- 2 = Compression spring with spring cup and retaining ring
- 3 = Piston with O-rings
- 4 = Input shaft assy

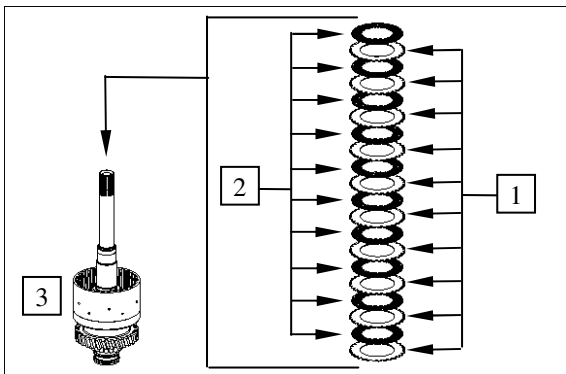


Figure 11

Install outer and inner disks alternately into the disk carrier (3) as shown in Figure 11,

starting with an outer disk and ending with an inner disk.

Legend:

- 1 = Outer disks (10 pcs)
- 2 = Inner disks (10 pcs)
- 3 = Input shaft assy

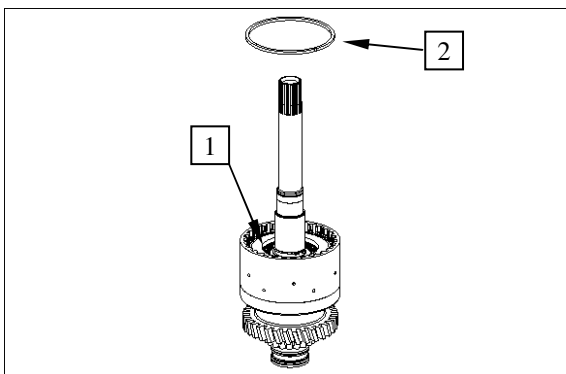


Figure 12

Mount end plate (1) with the flat side showing towards the disk package and fix it by means of snap ring (2) (e.g. thickness = 2.5 mm / recommended value).

 **Pay attention to the installation position of the end plate!**

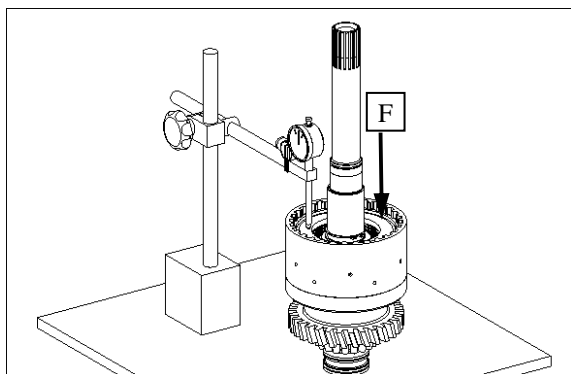


Figure 13

Equally press on end plate with F (approx. 18 N to 20 N = 1.8 kg to 2.0 kg) and set dial indicator to "zero".

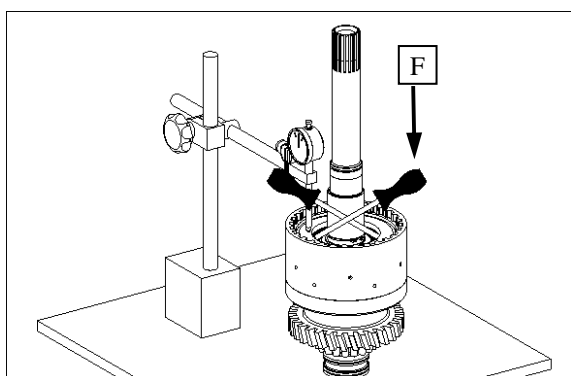


Figure 14

Then press end plate against the snap ring (upwards) and read the disk clearance.



Disk clearance: 2.0 to 2.3 mm!



In case of deviations, the disk clearance must be corrected with an appropriate snap ring (optional thickness = 2.0 3.5 mm/available in steps of 0.25 mm)!

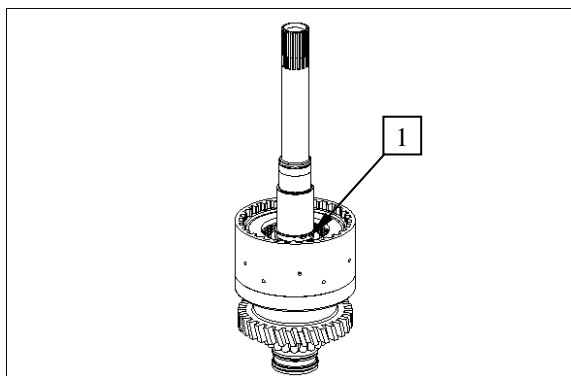


Figure 15

Snap retaining ring 40x1.75 (1) into the groove.



Contact for axial bearing - see Figure 16!

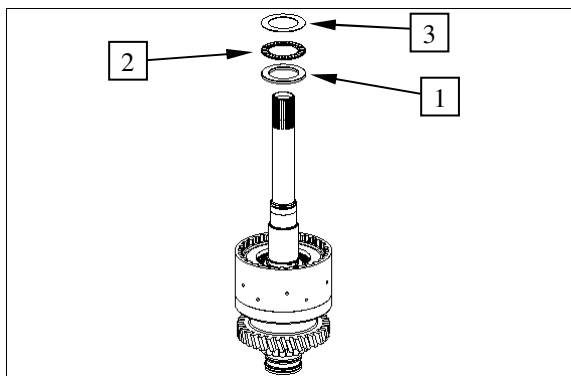


Figure 16

Mount running disk 40x60x3.5 (1), axial needle cage 40x60x3 (2) and axial washer 40x60x1 (3) and oil them.



Mount running disk (1), with the chamfer showing towards the retaining ring!

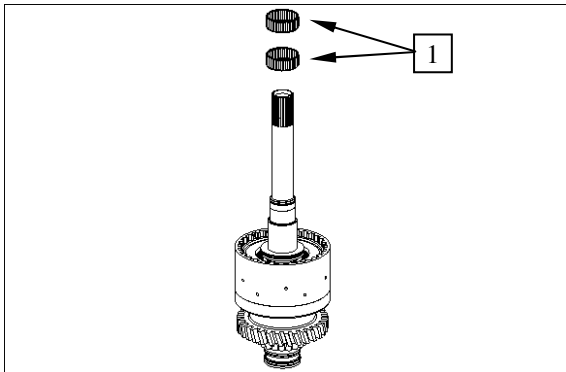


Figure 17

Mount needle cage 40x45x17 (1) and oil it.

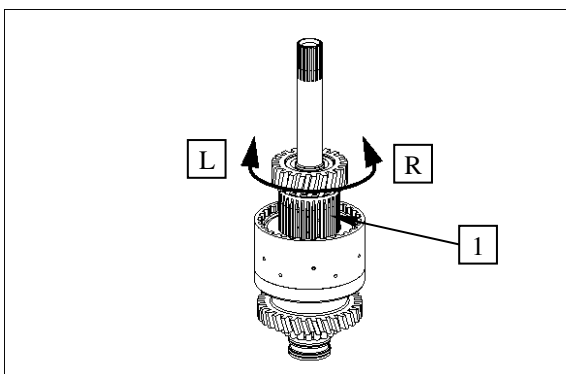


Figure 18

Mount inner disk carrier until contact is obtained.

Install inner disks by short ccw/cw rotations of the inner disk carrier (1).

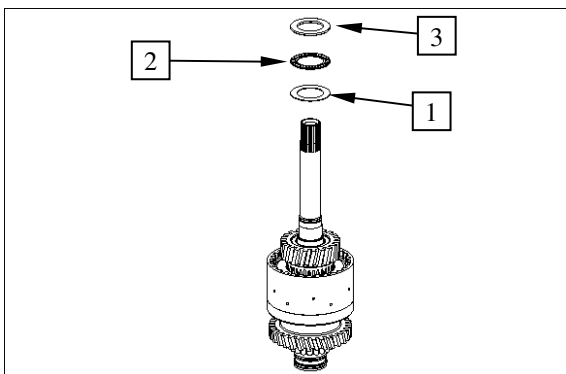


Figure 19

Mount axial washer 40x60x1 (1), axial needle cage 40x60x3 (2) and running disk (3) 40x60x3.5 and oil them.



Mount running disk (3), with the chamfer showing towards the tapered roller bearing!

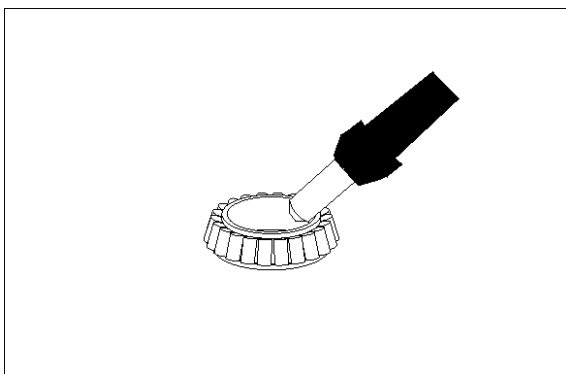


Figure 20

Heat up bearing inner ring (approx. 120° C).

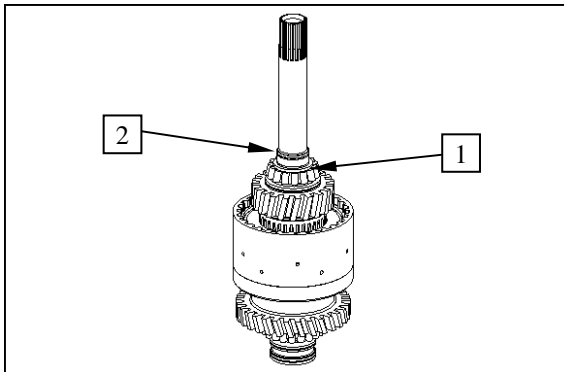


Figure 21

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling-down.

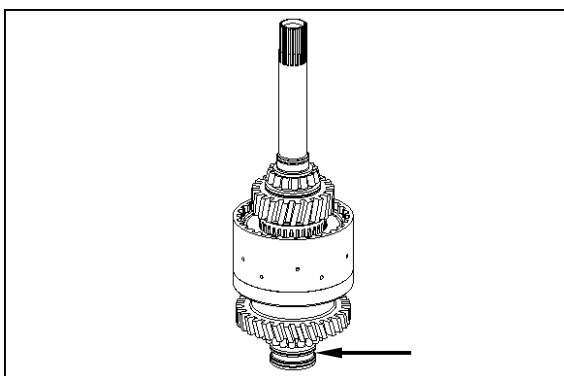


Figure 22



Check closing and opening of the clutch by means of compressed air at the hole (see arrow).

Closing and opening of the clutch must be clearly audible.

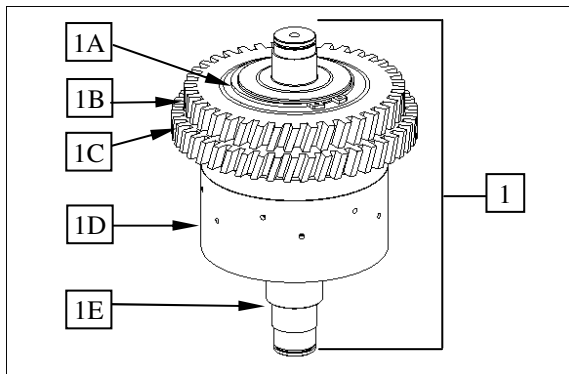


Figure 1

6.2 KV clutch



The clutch (1) is supplied by the spare parts service only as a complete assy which consists of:

- 1A = Retaining ring
- 1B = Helical gear
- 1C = Helical gear
- 1D = Disk carrier
- 1E = Shaft

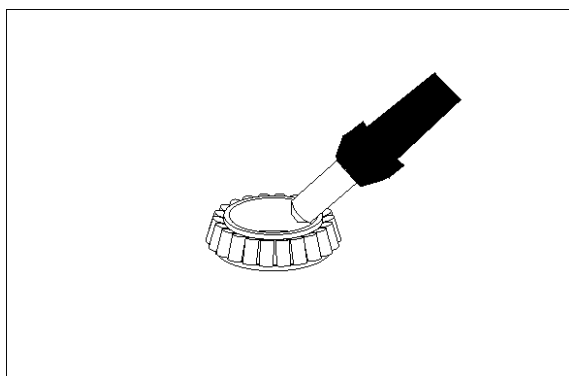


Figure 2

Heat up bearing inner ring (approx. 120° C).

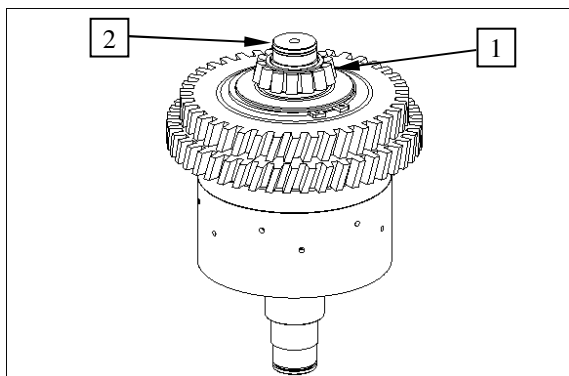


Figure 3

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling-down.

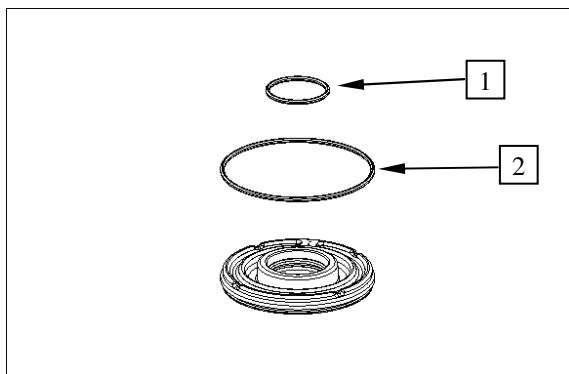


Figure 4

Insert both O-rings (1 and 2) into the piston grooves and oil them.

- 1 = 40x3
- 2 = 104.5x3

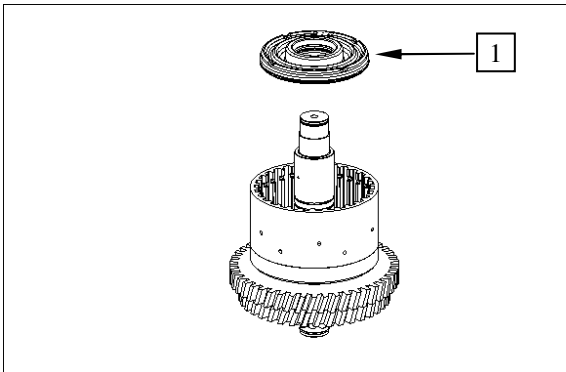


Figure 5

Insert piston (1) into the disk carrier.

 Pay attention to the installation position, see Figure!

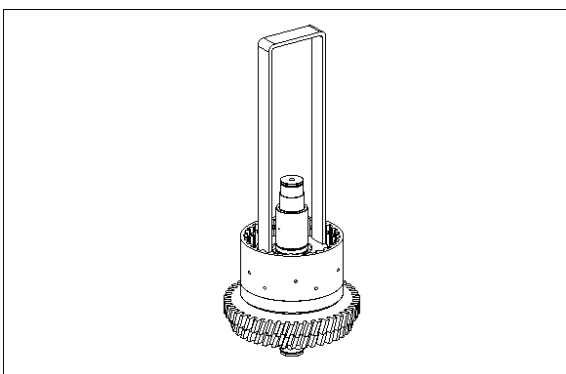


Figure 6

Use a hand-operated press to place piston into the disk carrier by means of the assembly aid.

(S) Assembly aid 5870 345 114

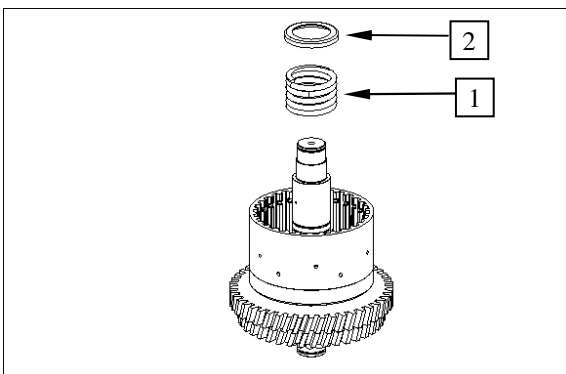


Figure 7

Mount compression spring (1) and spring cup (2).

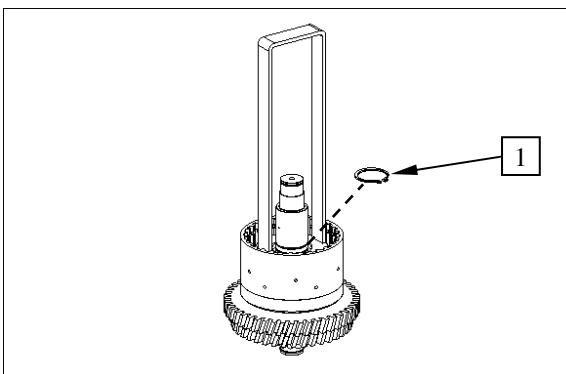


Figure 8

By means of the assembly aid, preload compression spring under a hand-operated press until the retaining ring 40x1.75 (1) can be snapped in.

(S) Assembly aid 5870 345 114

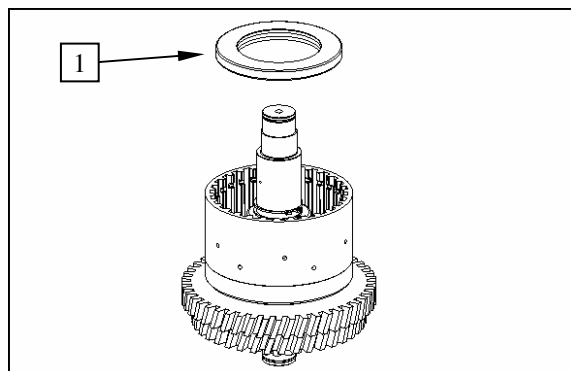


Figure 9

Mount plate assy with cup springs (1), with the open side showing towards the piston.

Installation position of plate see also Figure 10!

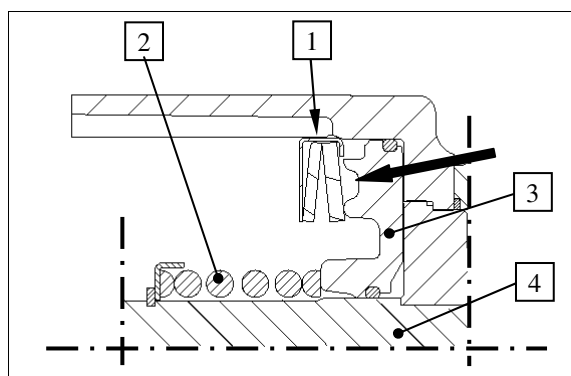


Figure 10

Fit plate (1) according to sketch (see arrow).

Legend:

- 1 = Plate assy with cup springs
- 2 = Compression spring with spring cup and retaining ring
- 3 = Piston with O-rings
- 4 = Input shaft assy

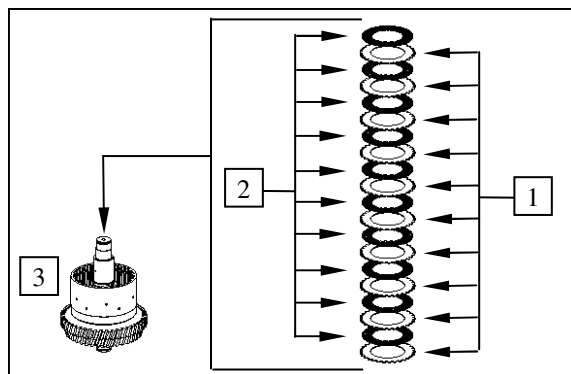


Figure 11

Install outer and inner disks alternately into the disk carrier (3) as shown in Figure 11,

starting with an outer disk and ending with an inner disk.

Legend:

- 1 = Outer disks (10 pcs)
- 2 = Inner disks (10 pcs)
- 3 = Clutch assy

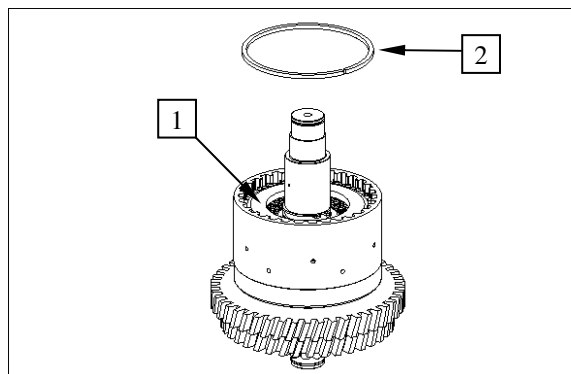


Figure 12

Mount end plate (1) with the flat side showing towards the disk package and fix it by means of snap ring (2) (e.g. thickness = 2.5 mm / recommended value).

Pay attention to the installation position of the end plate!

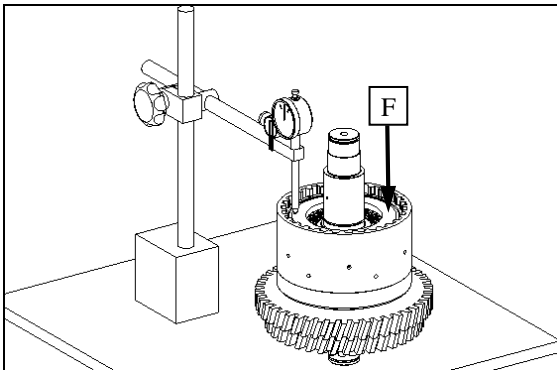


Figure 13

Equally press on end plate with F (approx. 18 N to 20 N = 1.8 kg to 2.0 kg) and set dial indicator to "zero".

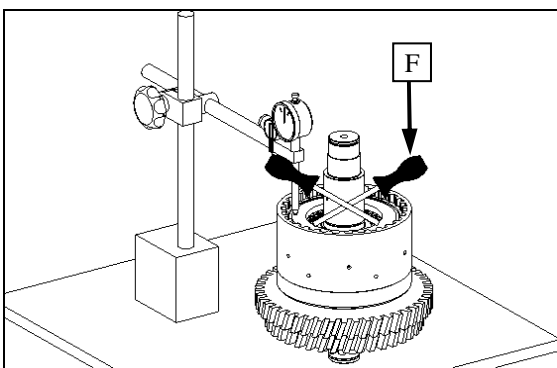


Figure 14

Then press end plate against the snap ring (upwards) and read the disk clearance.

Disk clearance: 2.0 to 2.3 mm!

In case of deviations, the disk clearance must be corrected with an appropriate snap ring (optional thickness = 2.0 3.5 mm/available in steps of 0.25 mm)!

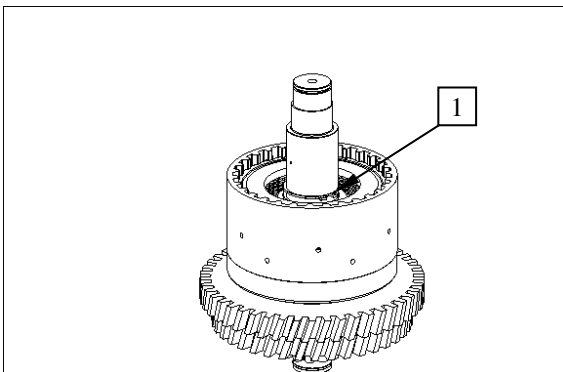


Figure 15

Snap retaining ring 40x1.75 (1) into the groove.

Contact for axial bearing - see Figure 16!

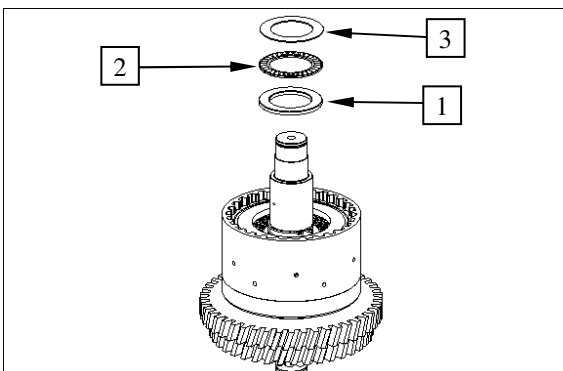


Figure 16

Mount running disk 40x60x3.5 (1), axial needle cage 40x60x3 (2) and axial washer 40x60x1 (3) and oil them.

Mount running disk (1), with the chamfer showing towards the retaining ring!

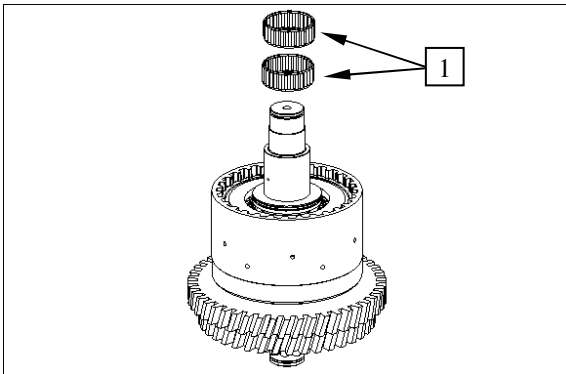


Figure 17

Mount needle cage 40x45x17 (1) and oil it.

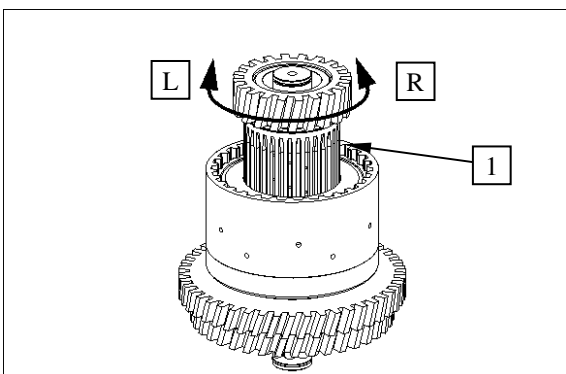


Figure 18

Mount inner disk carrier until contact is obtained.

Install inner disks by short ccw/cw rotations of the inner disk carrier (1).

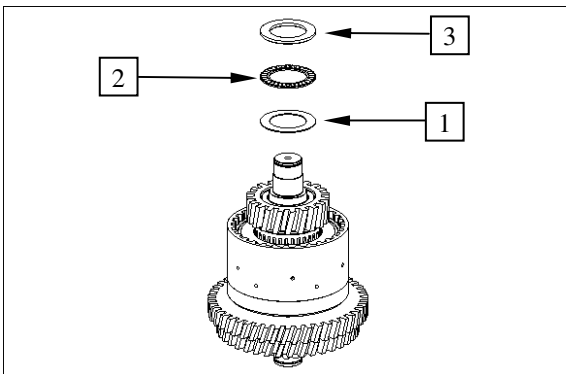


Figure 19

Mount axial washer 40x60x1 (1), axial needle cage 40x60x3 (2) and running disk (3) 40x60x3.5 and oil them.



Mount running disk (3), with the chamfer showing towards the tapered roller bearing!

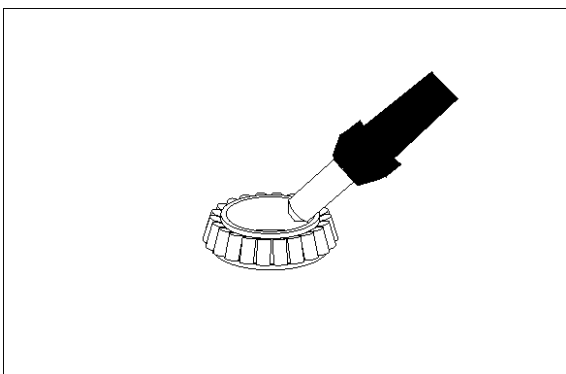


Figure 20

Heat up bearing inner ring (approx. 120° C).

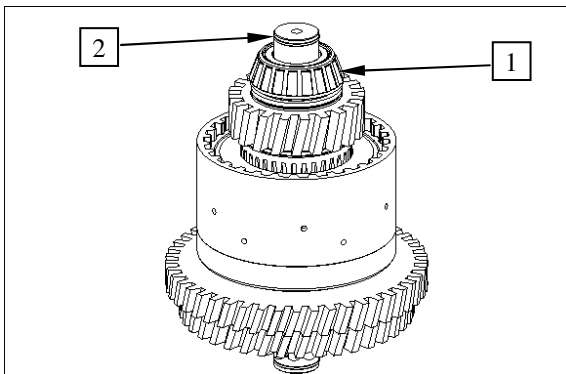


Figure 21

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling-down.

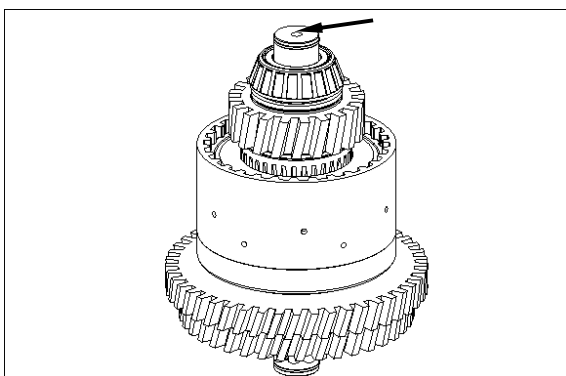


Figure 22



Check closing and opening of the clutch by means of compressed air at the hole (see arrow).

Closing and opening of the clutch must be clearly audible.

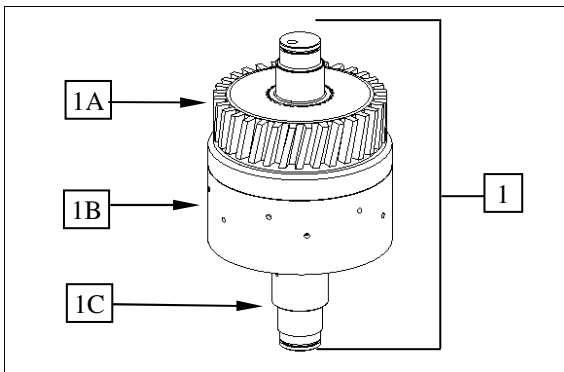


Figure 1

6.3 K1 clutch



The clutch (1) is supplied by the spare parts service only as a complete assy which consists of:

- 1A = Helical gear
- 1B = Disk carrier
- 1C = Shaft

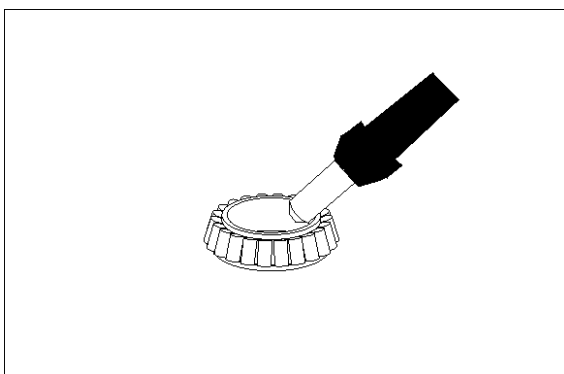


Figure 2

Heat up bearing inner ring (approx. 120° C).

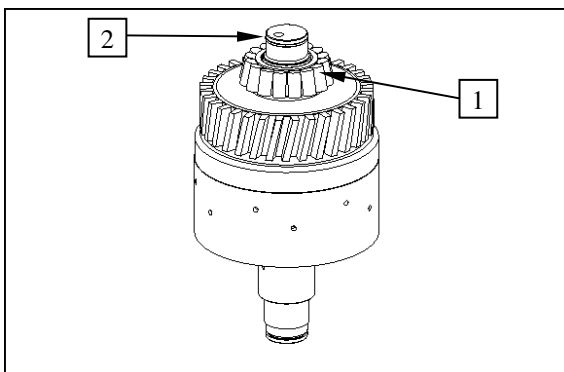


Figure 3

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling-down.

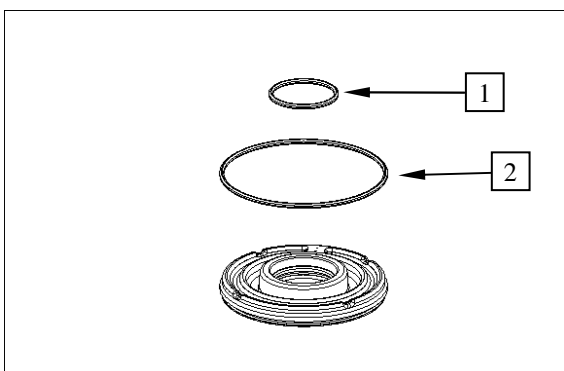


Figure 4

Insert both O-rings (1 and 2) into the piston grooves and oil them.

- 1 = 40x3
- 2 = 104.5x3

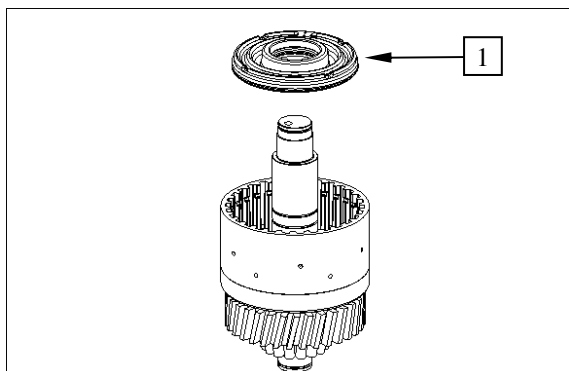


Figure 5

Insert piston (1) into the disk carrier.



Pay attention to the installation position, see Figure!

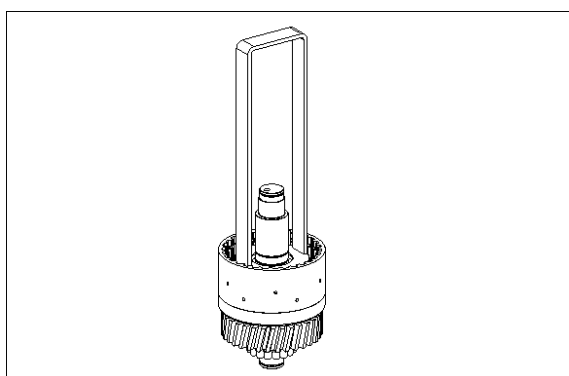


Figure 6

Use a hand-operated press to place piston into the disk carrier by means of the assembly aid.

(S) Assembly aid

5870 345 114

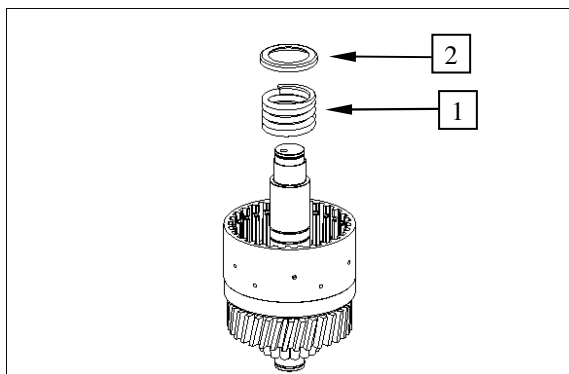


Figure 7

Mount compression spring (1) and spring cup (2).

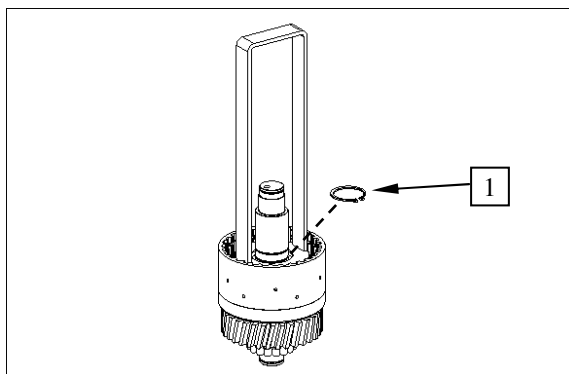


Figure 8

By means of the assembly aid, preload compression spring under a hand-operated press until the retaining ring 40x1.75 (1) can be snapped in.

(S) Assembly aid

5870 345 114

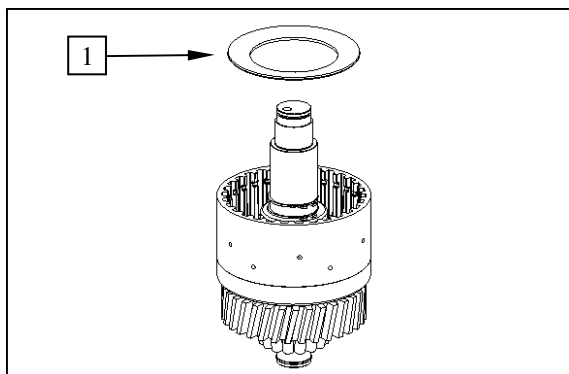


Figure 9

Mount cup spring 112x75x2.55 (1) with the convex side showing towards the piston.

➡ Installation position of cup spring see also Figure 10!

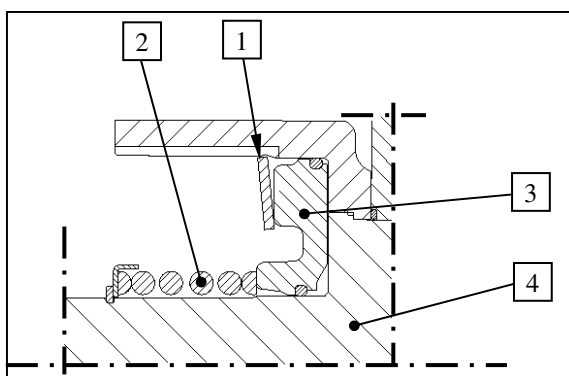


Figure 10

Install cup spring (1) according to the sketch.

Legend:

- 1 = Cup spring 112x75x2.55 (convex side towards the piston)
- 2 = Compression spring with spring cup and retaining ring
- 3 = Piston with O-rings
- 4 = Clutch assy

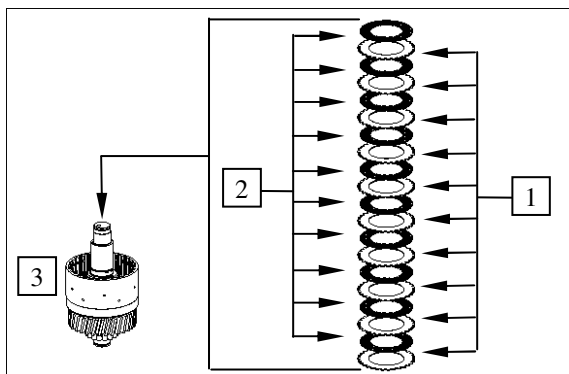


Figure 11

Install outer and inner disks alternately into the disk carrier (3) as shown in Figure 11,

starting with an outer disk and ending with an inner disk.

Legend:

- 1 = Outer disks (10 pcs)
- 2 = Inner disks (10 pcs)
- 3 = Clutch assy

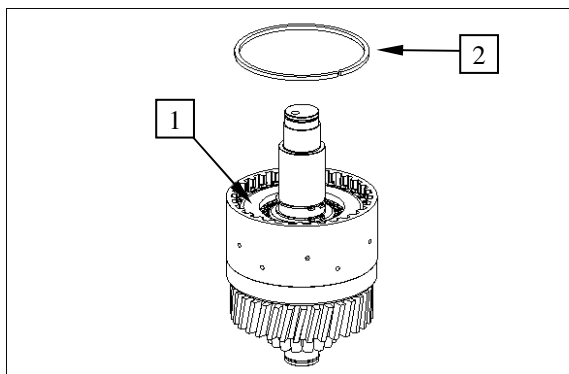


Figure 12

Mount end plate (1) with the flat side showing towards the disk package and fix it by means of snap ring (2) (e.g. thickness = 2.5 mm / recommended value).

➡ Pay attention to the installation position of the end plate!

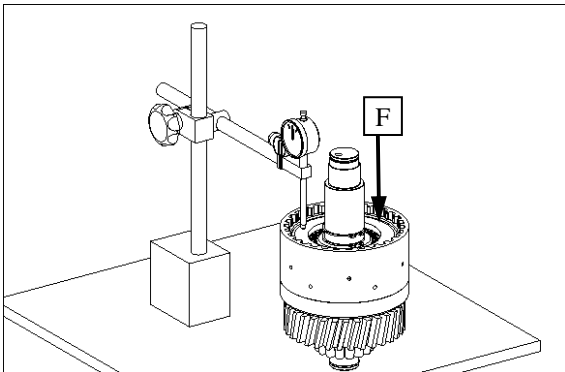


Figure 13

Equally press on end plate with F (approx. 18 N to 20 N = 1.8 kg to 2.0 kg) and set dial indicator to "zero".

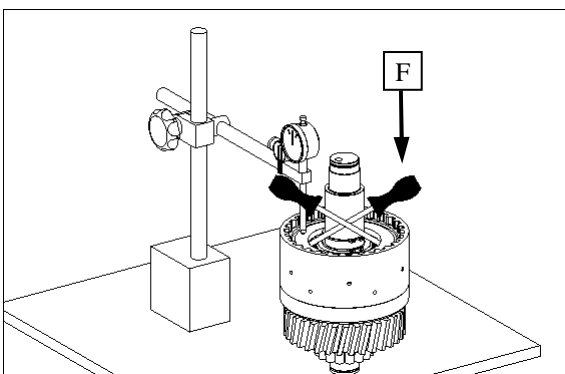


Figure 14

Then press end plate against the snap ring (upwards) and read the disk clearance.

 **Disk clearance: 2.0 to 2.3 mm!**

 **In case of deviations, the disk clearance must be corrected with an appropriate snap ring (optional thickness = 2.0 3.5 mm/available in steps of 0.25 mm)!**

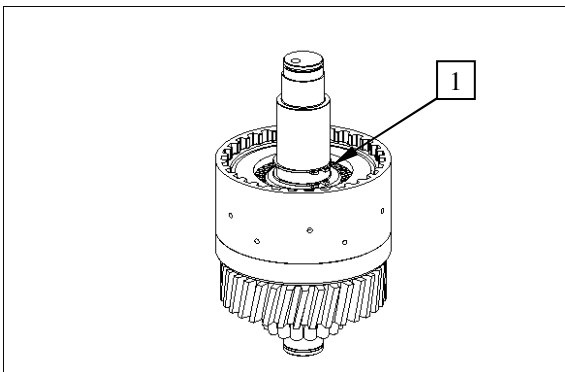


Figure 15

Snap retaining ring 40x1.75 (1) into the groove.

 **Contact for axial bearing – see Figure 16!**

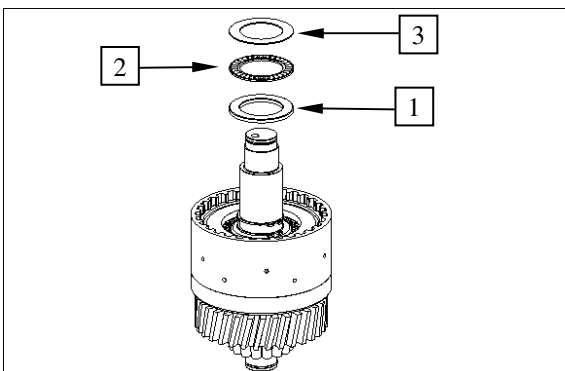


Figure 16

Mount running disk 40x60x3.5 (1), axial needle cage 40x60x3 (2) and axial washer 40x60x1 (3) and oil them.

 **Mount running disk (1) with the chamfer showing towards the retaining ring!**

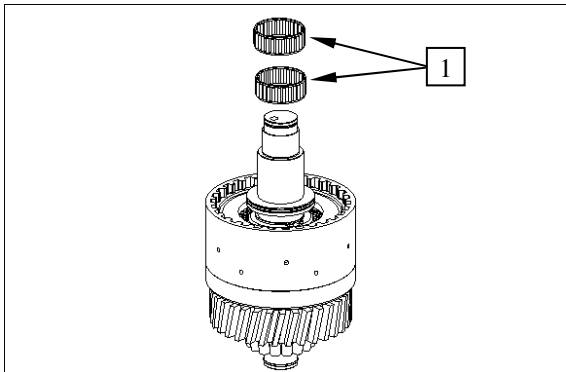


Figure 17

Mount needle cage 40x45x17 (1) and oil it.

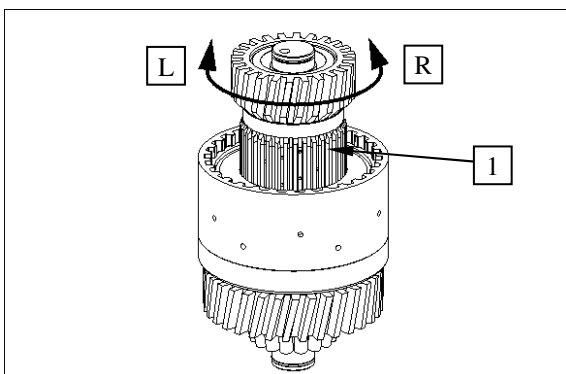


Figure 18

Mount inner disk carrier until contact is obtained.

Install inner disks by short ccw/cw rotations of the inner disk carrier (1).

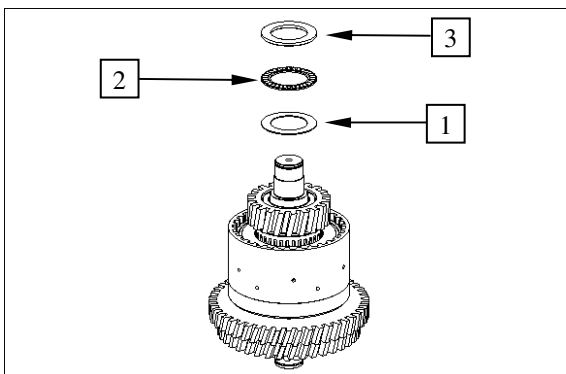


Figure 19

Mount axial washer 40x60x1 (1), axial needle cage 40x60x3 (2) and running disk (3) 40x60x3.5 and oil them.



Mount running disk (3), with the chamfer showing towards the tapered roller bearing!

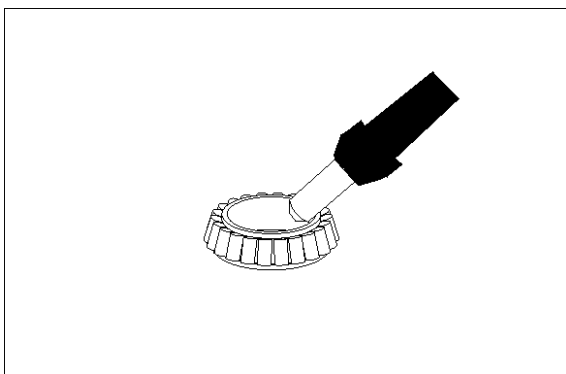


Figure 20

Heat up bearing inner ring (approx. 120° C).

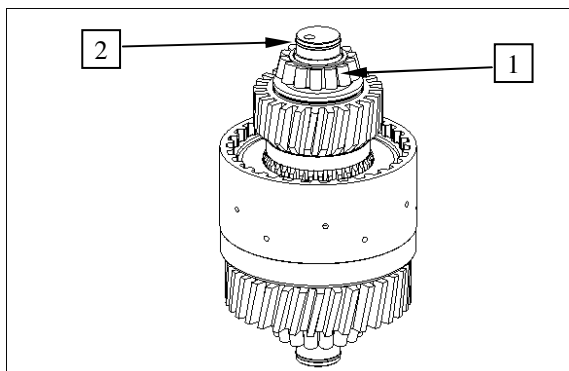


Figure 21

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling-down!

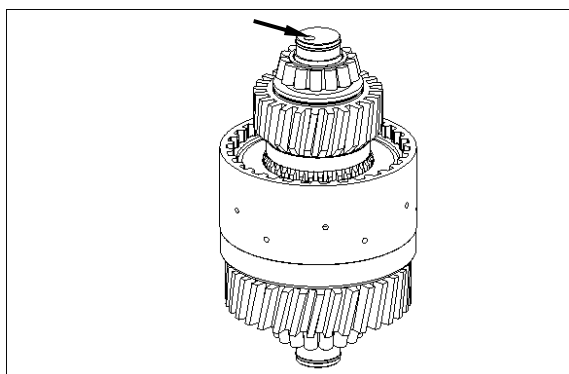


Figure 22



**Check closing and opening of the clutch by means of compressed air at the hole (see arrow).
Closing and opening of the clutch must be clearly audible.**

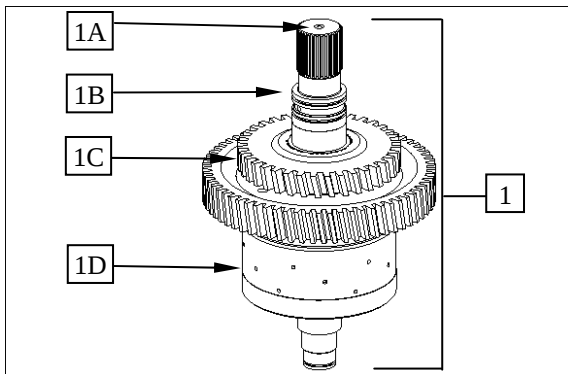


Figure 1

6.4 K2 clutch

6.4.1 Version 4 WG-94

The clutch (1) is supplied by the spare parts service only as a complete assy which consists of:

- 1A = Ball
- 1B = Shaft
- 1C = Helical gear
- 1D = Disk carrier

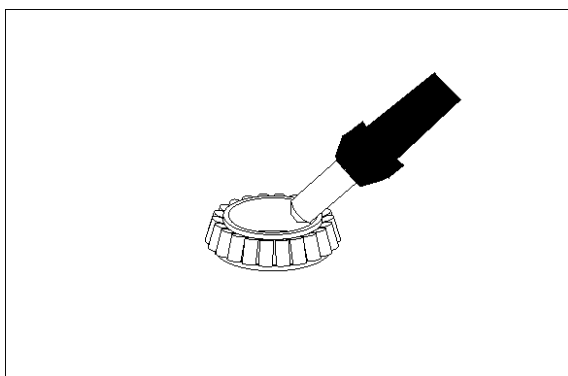


Figure 2

Heat bearing inner ring (approx. 120° C).

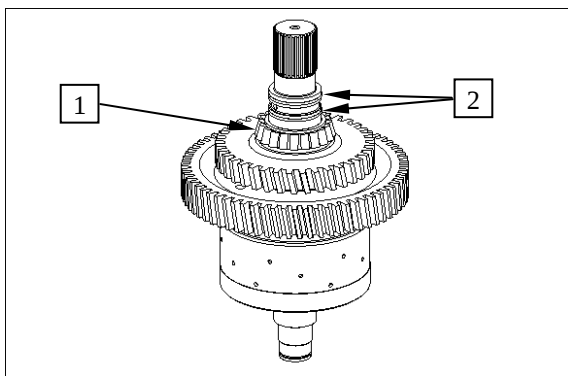


Figure 3

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular rings 50x2.5 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling-down.

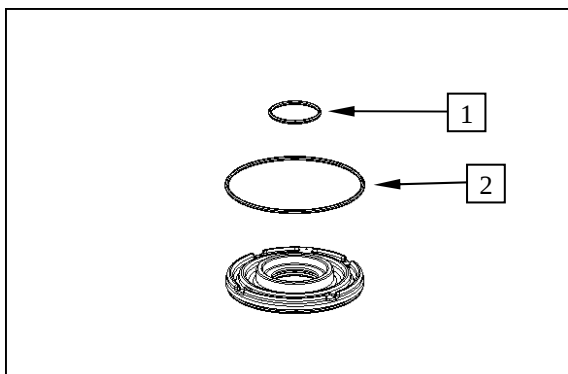


Figure 4

Insert both O-rings (1 and 2) into the piston grooves and oil them.

- 1 = 40x3
- 2 = 115x3

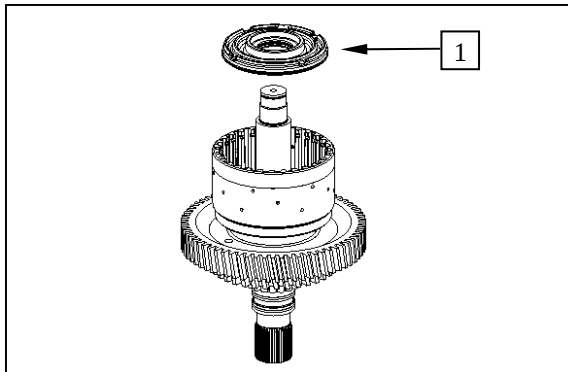


Figure 5

Insert piston (1) into the disk carrier.

Pay attention to the installation position, see Figure!

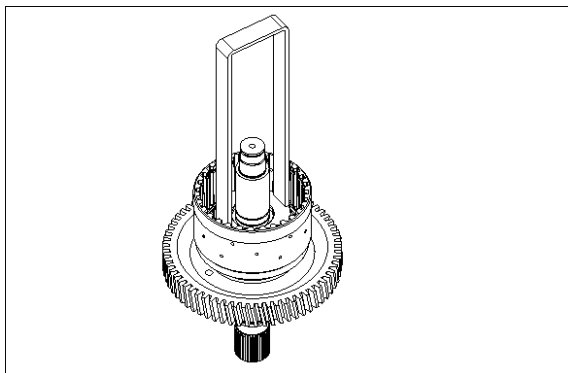


Figure 6

Use a hand-operated press to place piston into the disk carrier by means of the assembly aid.

(S) Assembly aid 5870 345 114

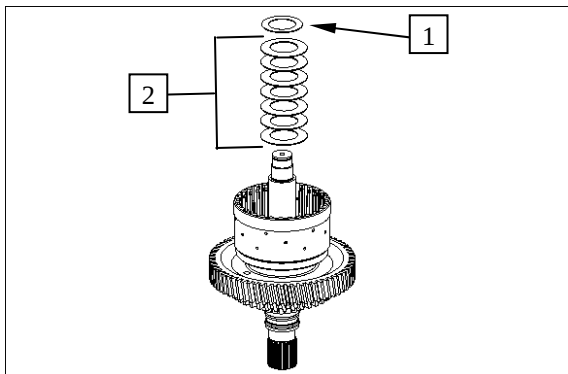


Figure 7

Mount cup spring package (1) and axial washer (2).

Installation position of cup springs see Figure 8!

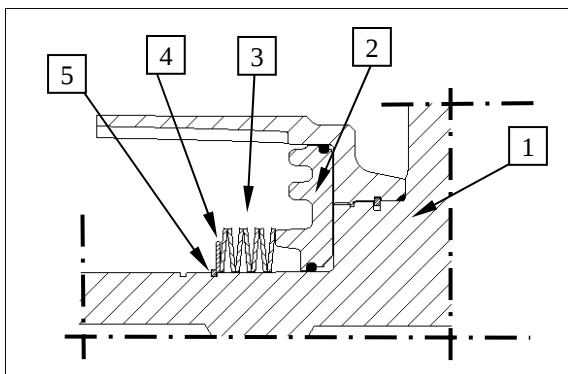


Figure 8

Fit cup springs according to the sketch.

Legend:

- 1 = Clutch
- 2 = Piston with O-rings
- 3 = Cup springs (7 pcs)
- 4 = Axial washer (40x60x1)
- 5 = Retaining ring (40x1.75)

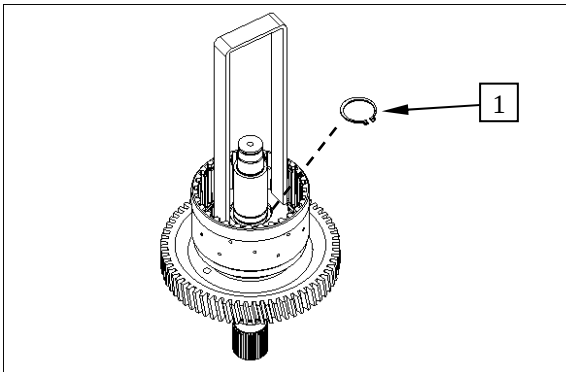


Figure 9

By means of the assembly aid, preload cup springs under a hand-operated press until the retaining ring 40x1.75 (1) can be engaged.

(S) Assembly aid

5870 345 114

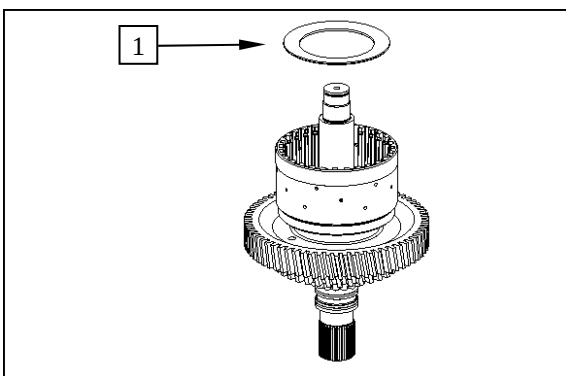


Figure 10

Mount cup spring 122.7x87x2.55 (1) with the convex side showing towards the piston.



Installation position of cup spring see also Figure 11!

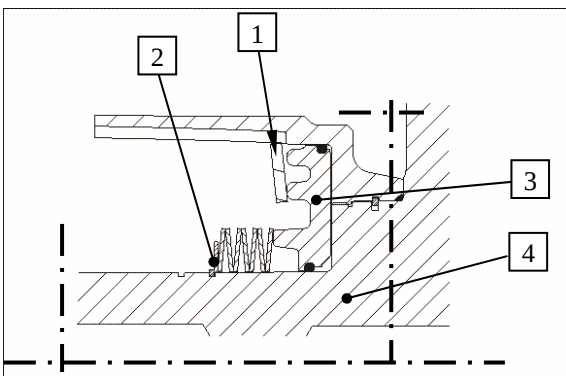


Figure 11

Install cup spring (1) according to the sketch.

Legend:

- 1 = Cup spring 122.7x87x2.55 (convex side showing towards the piston)
- 2 = Axial washer with cup spring and retaining ring
- 3 = Piston with O-rings
- 4 = Clutch assy

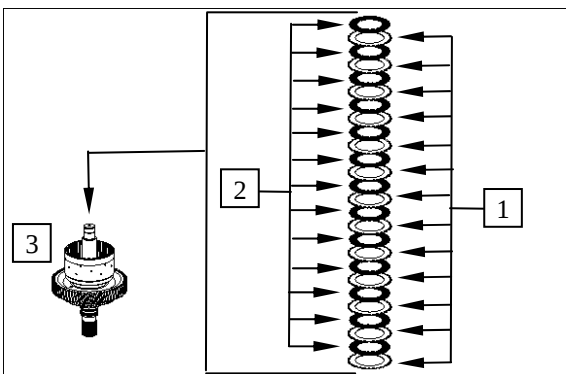


Figure 12

Install outer and inner disks alternately into the disk carrier (3) as shown in Figure 11,

starting with an outer disk and ending with an inner disk.

Legend:

- 1 = Outer disks (13 pcs)
- 2 = Inner disks (13 pcs)
- 3 = Clutch assy

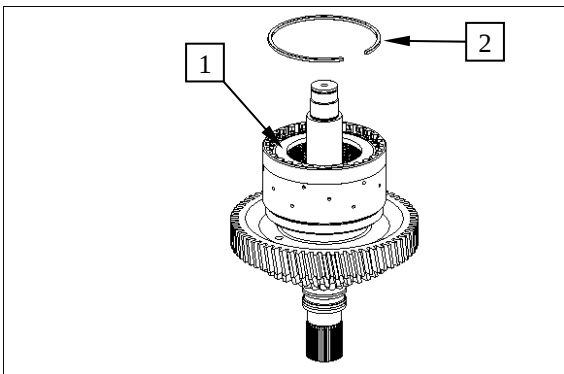


Figure 13

Mount end plate (1) with the flat side showing towards the disk package and fix it by means of snap ring (2) (e.g. thickness = 2.5 mm / recommended value).

 **Pay attention to the installation position of the end plate!**

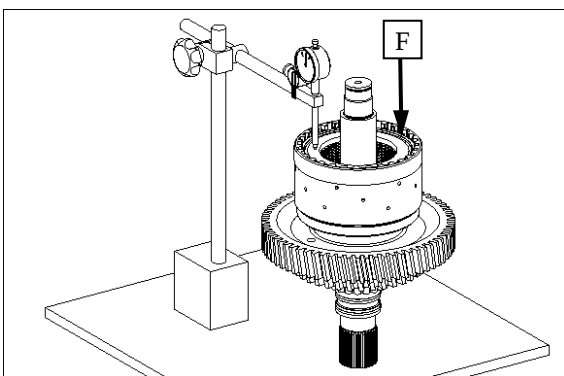


Figure 14

Equally press on end plate with F (approx. 18 N to 20 N = 1.8 kg to 2.0 kg) and set dial indicator to "zero".

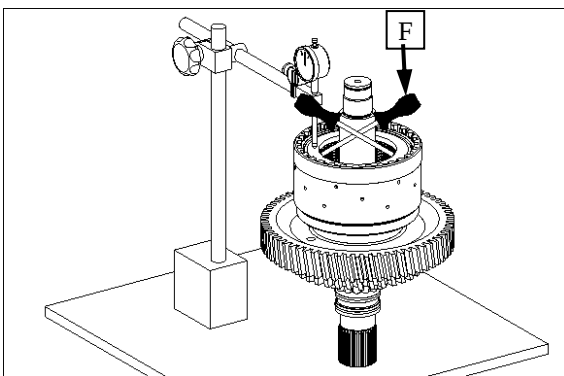


Figure 15

Then press end plate against the snap ring (upwards) and read the disk clearance.

 **Disk clearance: 2.2 to 2.5 mm!**

 **In case of deviations, the disk clearance must be corrected with an appropriate snap ring (optional thickness = 2.0 ... 3.5 mm/available in steps of 0.25 mm)!**

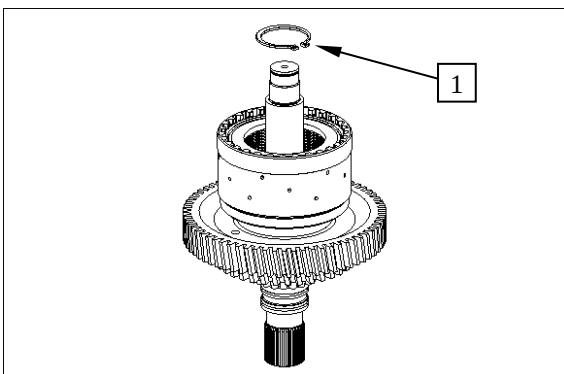


Figure 16

Engage retaining ring 40x1.75 (1) into the groove.

 **Contact for axial bearing - see Figure 17!**

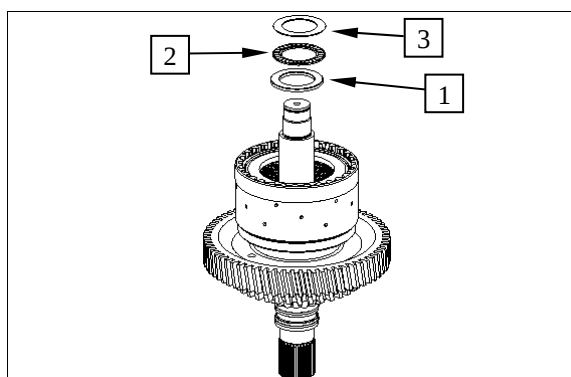


Figure 17

Mount running disk 40x60x3.5 (1), axial needle cage 40x60x3 (2) and axial washer 40x60x1 (3) and oil them.



Mount running disk (1) with the chamfer showing towards the retaining ring!

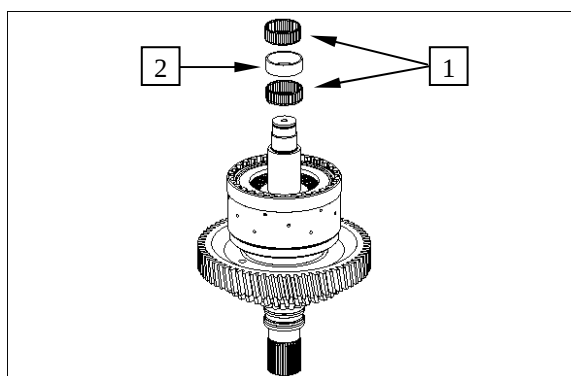


Figure 18

Mount needle cage 40x45x17 (1) and bushing (2) and oil them.

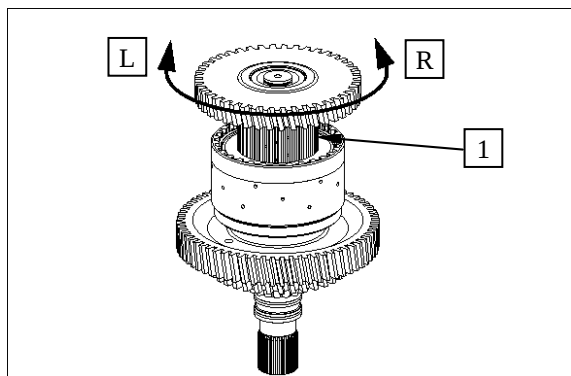


Figure 19

Mount inner disk carrier until contact is obtained.

Install inner disks by short ccw/cw rotations of the inner disk carrier (1).

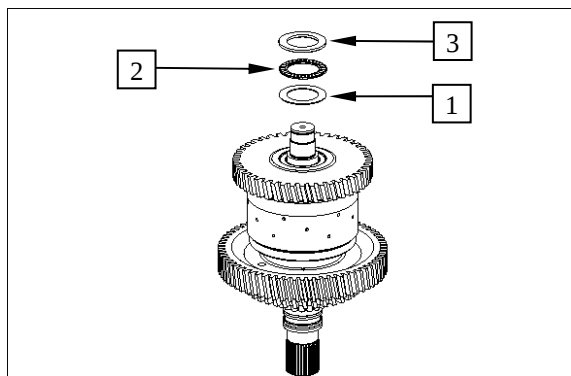


Figure 20

Mount axial washer 40x60x1 (1), axial needle cage 40x60x3 (2) and running disk (3) 40x60x3.5 and oil them.



Mount running disk (3), with the chamfer showing towards the tapered roller bearing!

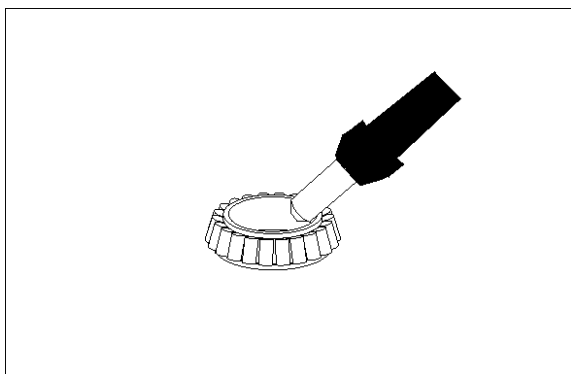


Figure 21

Heat bearing inner ring (approx. 120° C).

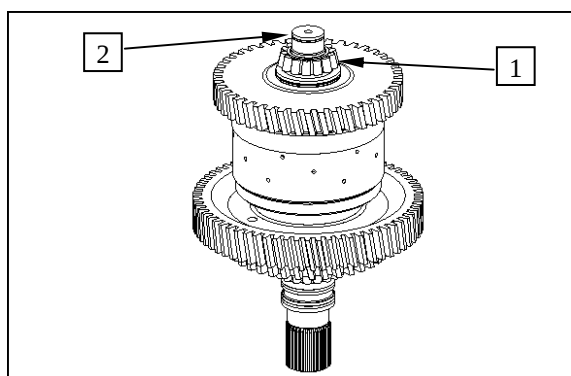


Figure 22

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling-down.

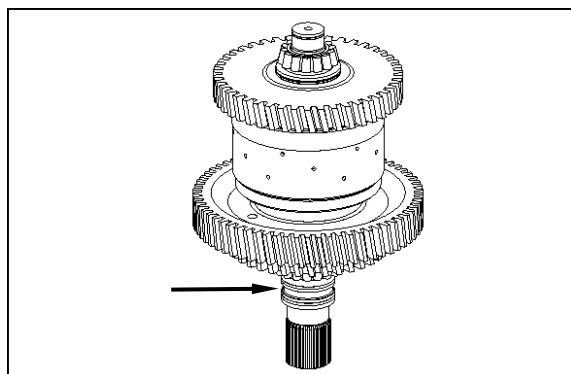


Figure 23



**Check closing and opening of the clutch by means of compressed air at the hole (see arrow).
Closing and opening of the clutch must be clearly audible.**

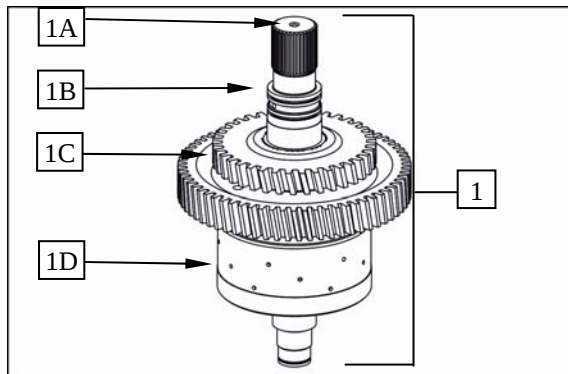


Figure 24

6.4.2 Version 5 WG-94

The clutch (1) is supplied by the spare parts service only as a complete assy which consists of:

- 1A = Ball
- 1B = Shaft
- 1C = Helical gear
- 1D = Disk carrier

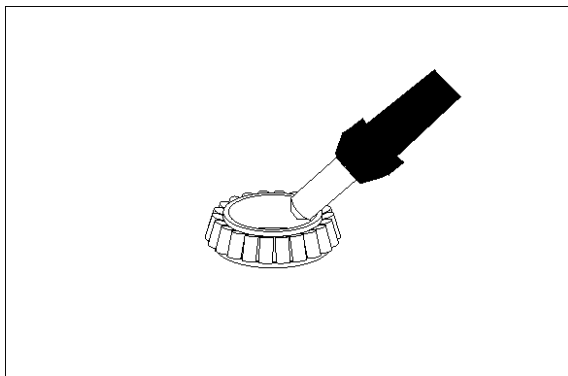


Figure 25

Heat bearing inner ring (approx. 120° C).

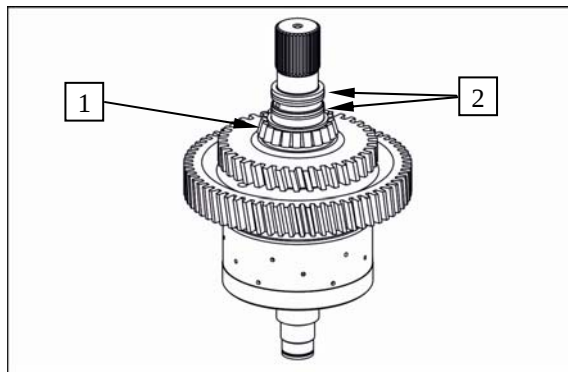


Figure 26

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular rings 30x2 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling-down.

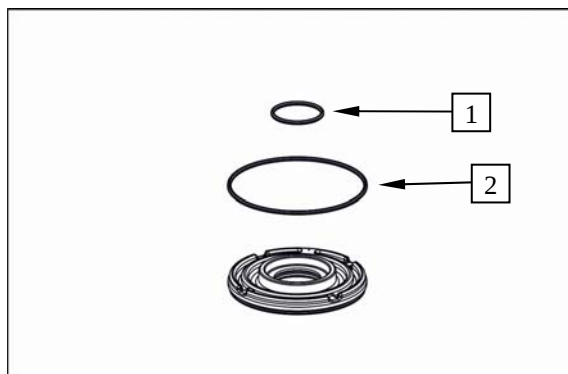


Figure 27

Insert both O-rings (1 and 2) into the piston grooves and oil them.

- 1 = 40x3
- 2 = 115x3

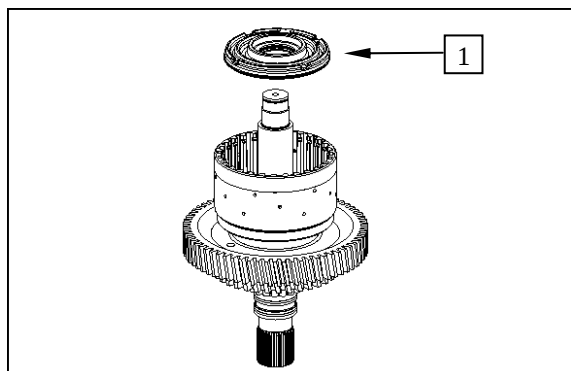


Figure 28

Insert piston (1) into the disk carrier.

Pay attention to the installation position, see Figure!

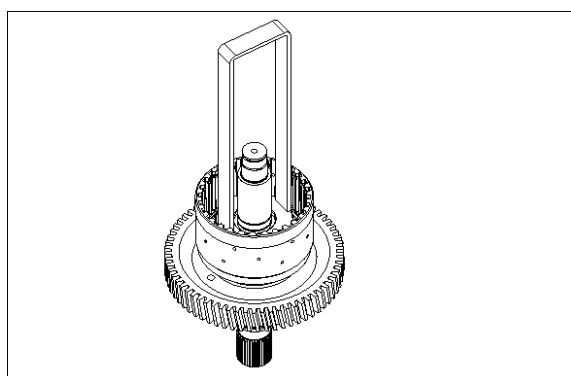


Figure 29

Use a hand-operated press to place piston into the disk carrier by means of the assembly aid.

(S) Assembly aid 5870 345 114

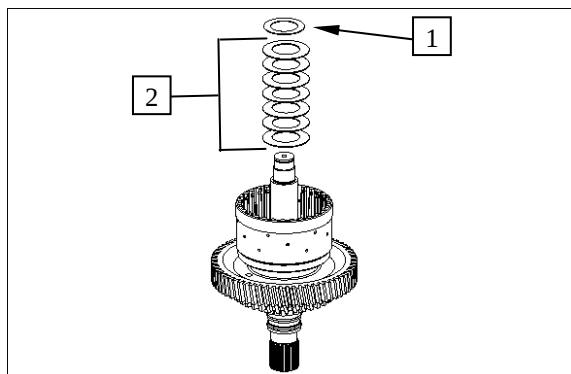


Figure 30

Mount cup spring package (1) and axial washer (2).

Installation position of cup springs, see Figure 31!

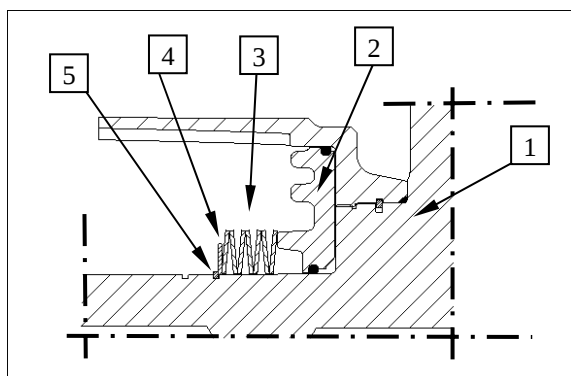


Figure 31

Fit cup springs according to the sketch.

Legend:

- 1 = Clutch
- 2 = Piston with O-rings
- 3 = Cup springs (7 pcs)
- 4 = Axial washer (40x60x1)
- 5 = Retaining ring (40x1.75)

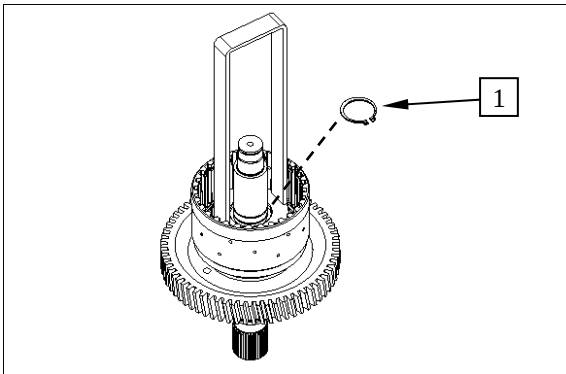


Figure 32

By means of the assembly aid, preload cup springs under a hand-operated press until the retaining ring 40x1.75 (1) can be engaged.

(S) Assembly aid

5870 345 114

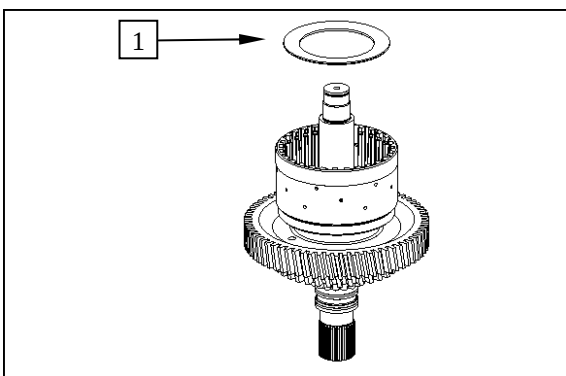


Figure 33

Mount cup spring 122.7x87x2.55 (1) with the convex side showing towards the piston.

➡ Installation position of cup spring see also Figure 34!

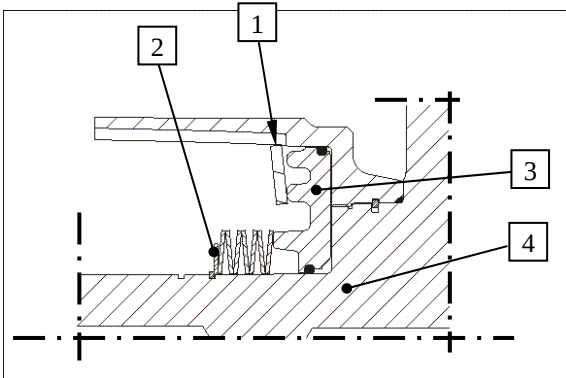


Figure 34

Install cup spring (1) according to the sketch.

Legend:

- 1 = Cup spring 122.7x87x2.55 (convex side showing towards the piston)
- 2 = Axial washer with cup spring and retaining ring
- 3 = Piston with O-rings
- 4 = Clutch assy

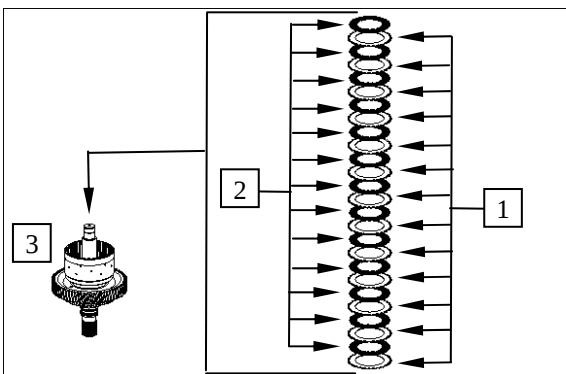


Figure 35

Install outer and inner disks alternately into the disk carrier (3) as shown in Figure 11,

starting with an outer disk and ending with an inner disk.

Legend:

- 1 = Outer disks (13 pcs)
- 2 = Inner disks (13 pcs)
- 3 = Clutch assy

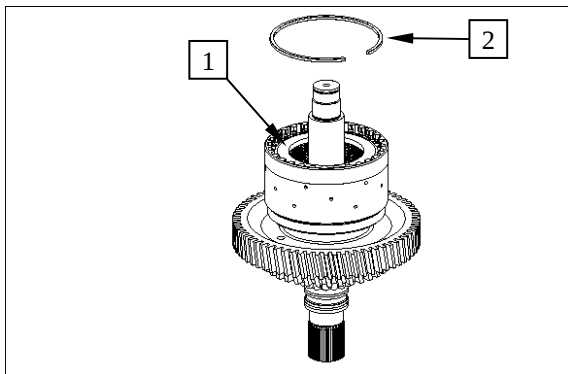


Figure 36

Mount end plate (1) with the flat side showing towards the disk package and fix it by means of snap ring (2) (e.g. thickness = 2.5 mm / recommended value).

 **Pay attention to the installation position of the end plate!**

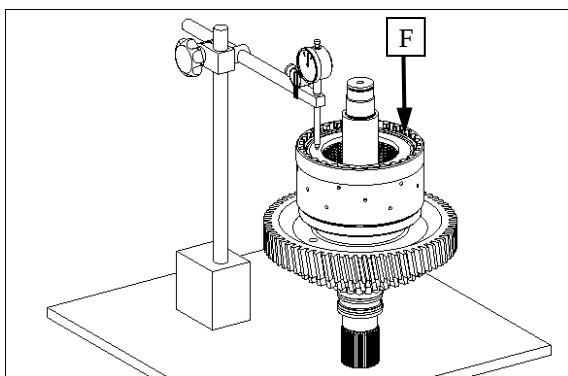


Figure 37

Equally press on end plate with F (approx. 18 N to 20 N = 1.8 kg to 2.0 kg) and set dial indicator to "zero".

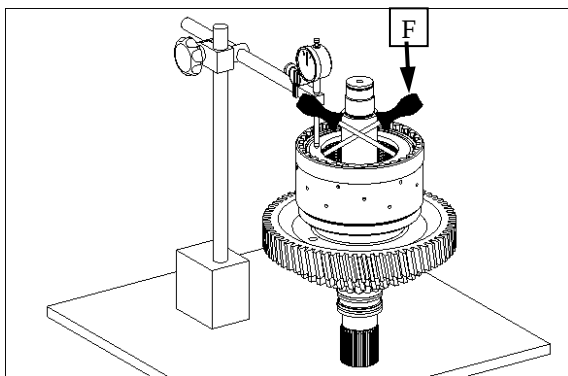


Figure 38

Then press end plate against the snap ring (upwards) and read the disk clearance.

 **Disk clearance: 2.2 to 2.5 mm!**

 **In case of deviations, the disk clearance must be corrected with an appropriate snap ring (optional thickness = 2.0 ... 3.5 mm/available in steps of 0.25 mm)!**

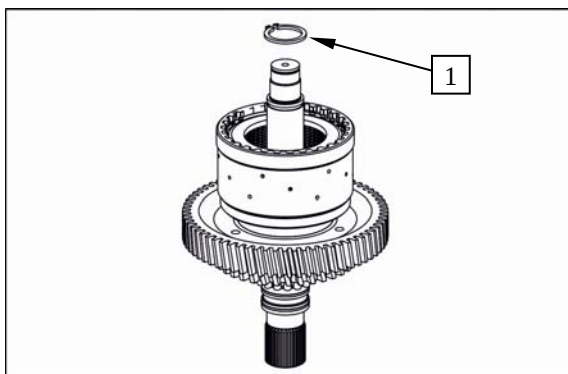


Figure 39

Engage retaining ring 38x2.6 (1) into the groove.

 **Contact for tapered roller bearing - see Figure 48!**

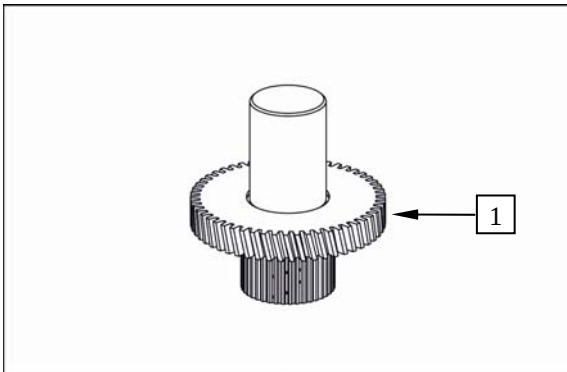


Figure 40

Set axial play of bearing of inner disk carrier - ± 0.05 mm (see Figure 40 to 46):

Press in both bearing outer rings into the inner disk carrier (1) until contact is obtained.

Then insert the bearing inner rings.

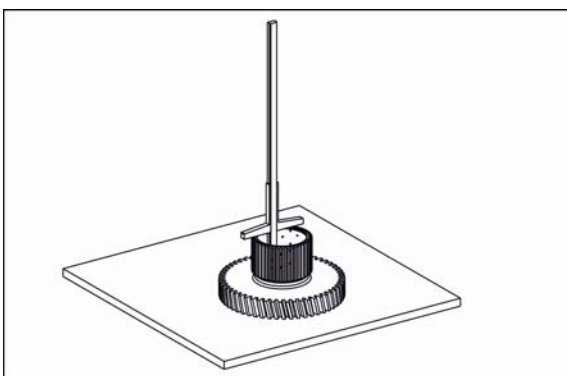


Figure 41

Determine dimension „X2“ of the inner disk carrier
→ see Figure 42

Calculation example:

Dimension A.....	89.75 mm
Dimension B.....	- 32.85 mm
Dimension X2	= 56.90 mm

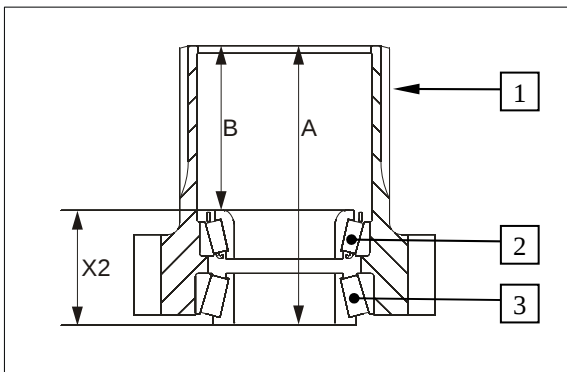


Figure 42

Legend:

- 1 = Inner disk carrier
- 2 = Tapered roller bearing 65x38.1x18
- 3 = Tapered roller bearing 69x38.1x19

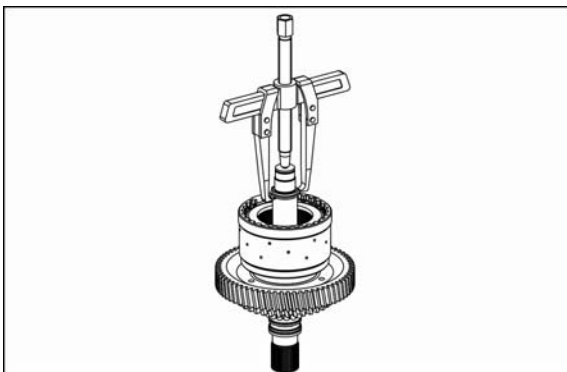


Figure 43

Mount the retaining ring e.g. 38x2.8 (1) and bring into contact position by using a two-armed puller.

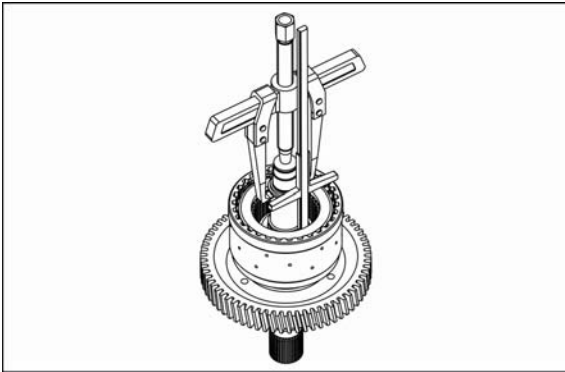


Figure 44

Determine dimension „X1“ from retaining ring (1) to retaining ring (2) → see Figure 45.

Dimension X1 = 59.60 mm

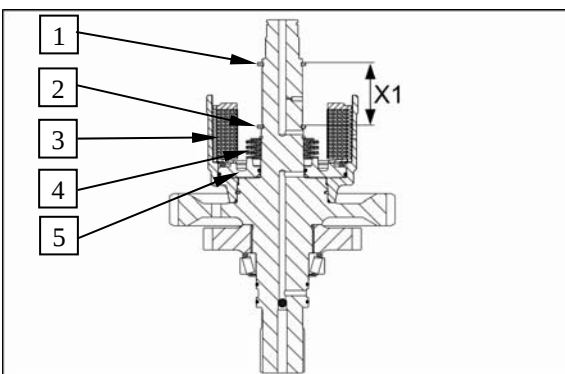


Figure 45

Legend:

- 1 = Retaining ring 38x2.8
- 2 = Retaining ring 38x2.6
- 3 = Disk package with end plate and snap ring
- 4 = Cup springs with axial washer and retaining ring
- 5 = Piston with O-rings

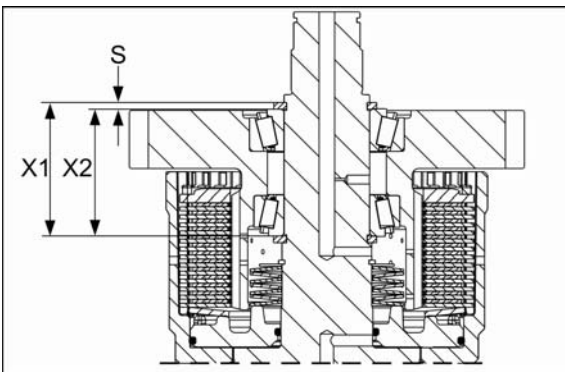


Figure 46

Axial play of bearing of inner disk carrier ± 0.05

Calculation example:

Dimension X1.....	59.50 mm
Dimension X2..... -	56.90 mm
Dimension S (retaining ring)..... =	2.60 mm



Determined retaining ring S = 2.60 mm



**Adjust axial play with retaining ring
(optional s = 2.1 ... 3.2 mm/available in steps of 0.10 mm)!**

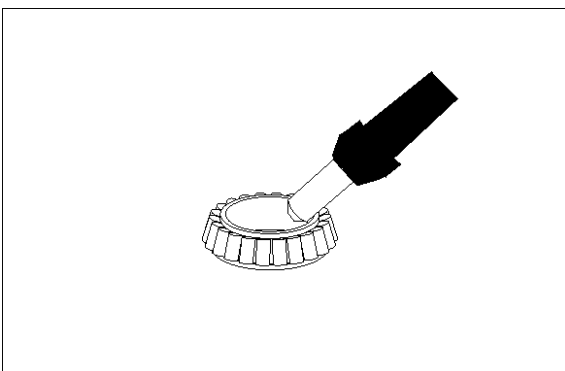


Figure 47

Heat bearing inner ring (approx. 120° C).

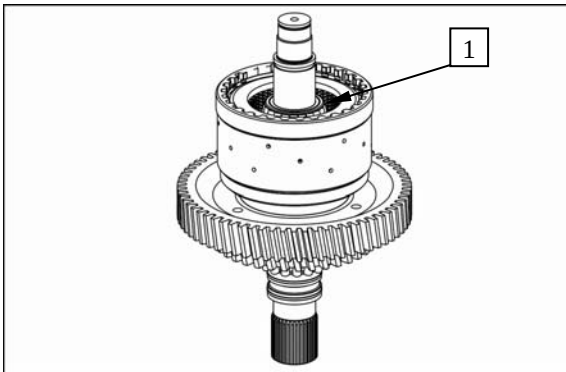


Figure 48

Mount bearing inner ring (1) until contact is obtained.



Different bearing sizes → see Figure 42.



Wear protective gloves!



Adjust bearing inner ring after cooling down!

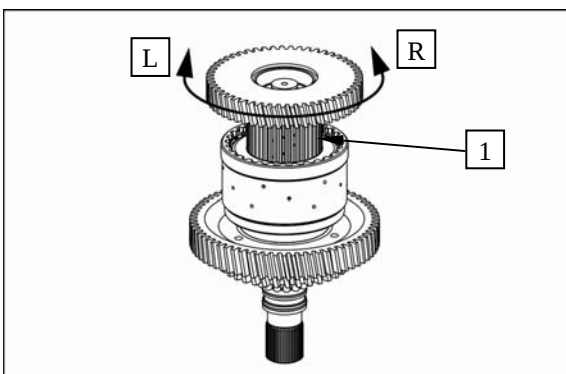


Figure 49

Insert inner disk carrier until contact is obtained.

Mount the inner disks onto the inner disk carrier by shortly rotating them ccw/cw.

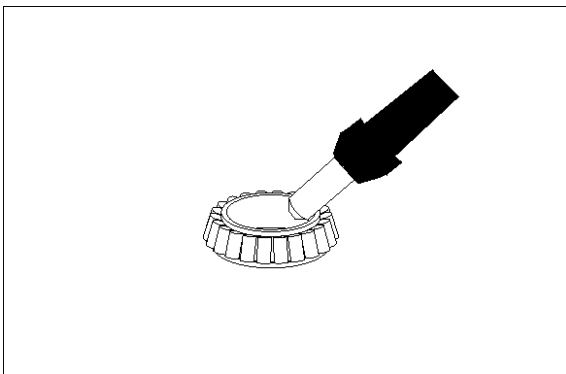


Figure 50

Heat bearing inner ring (approx. 120° C).

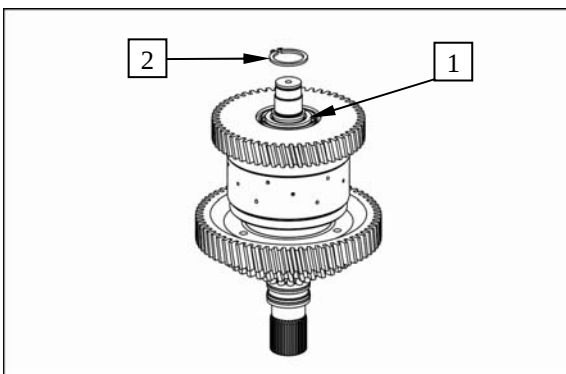


Figure 51

Mount bearing inner ring (1) until contact is obtained.



Wear protective gloves!



Adjust bearing inner ring after cooling down!

Engage retaining ring 38x2.6 (2).



Pay attention to an exact contact of the retaining ring in the groove!

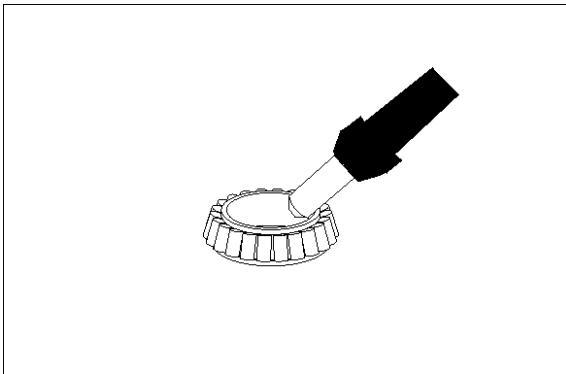


Figure 52

Heat bearing inner ring (approx. 120° C).

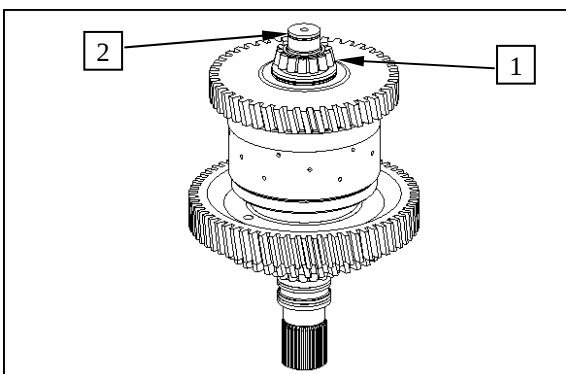


Figure 53

Insert bearing inner ring (1) until contact is obtained.

Install rectangular ring 30x2 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling down!

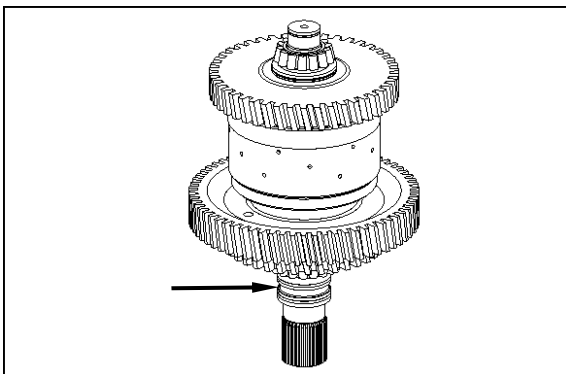


Figure 54



Check closing and opening of the clutch by means of compressed air on the bore (see arrow).

Closing and opening of the clutch must be clearly audible.

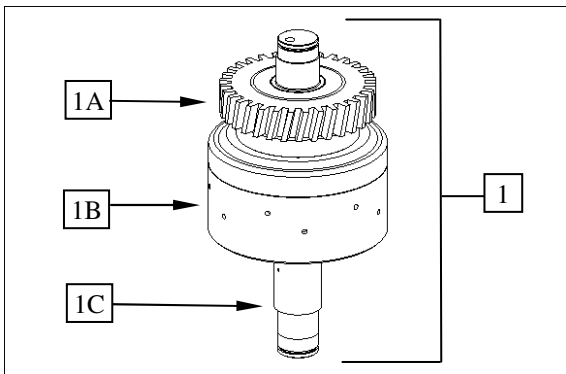


Figure 1

6.5 K3 clutch



The clutch (1) is supplied by the spare parts service only as a complete assy which consists of:

1A = Helical gear

1B = Disk carrier

1C = Shaft

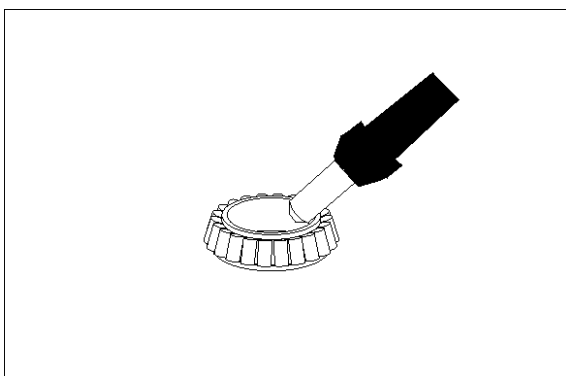


Figure 2

Heat up bearing inner ring (approx. 120° C).

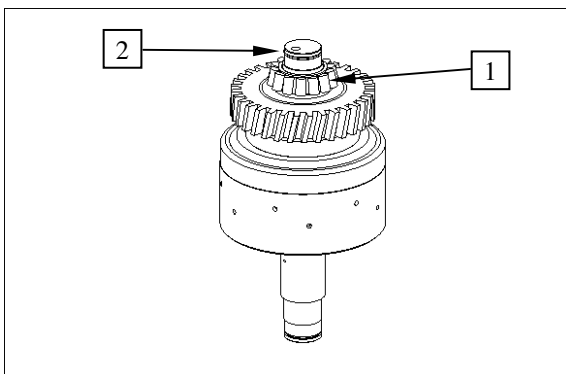


Figure 3

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling-down!

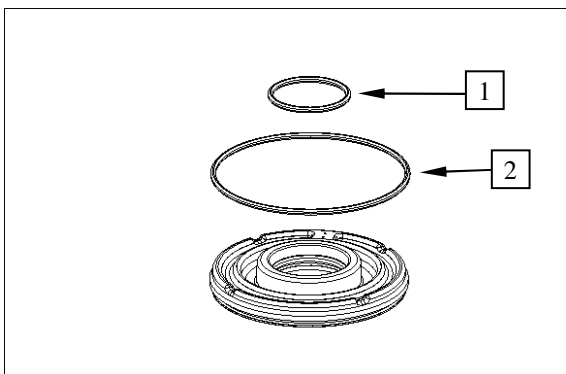


Figure 4

Insert both O-rings (1 and 2) into the piston grooves and oil them.

1 = 40x3

2 = 104.5x3

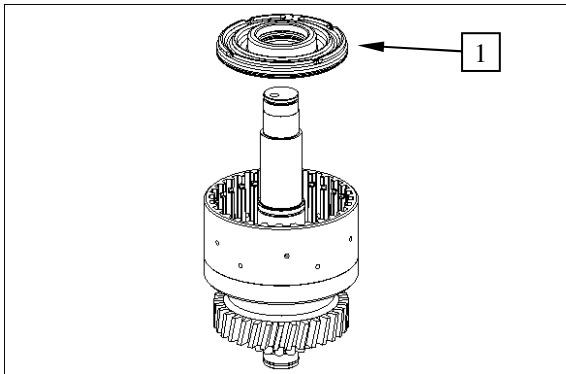


Figure 5

Insert piston (1) into the disk carrier.

 Pay attention to the installation position, see Figure!

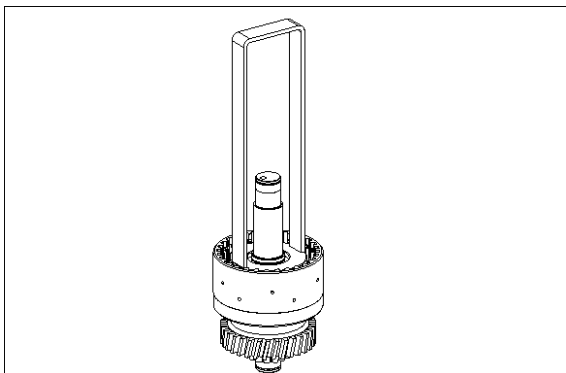


Figure 6

Use a hand-operated press to place piston into the disk carrier by means of the assembly aid.

(S) Assembly aid 5870 345 114

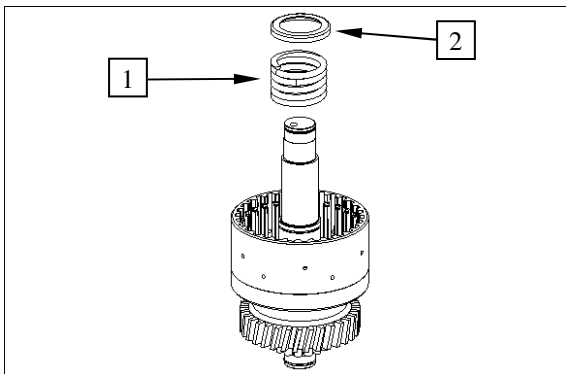


Figure 7

Mount compression spring (1) and spring cup (2).

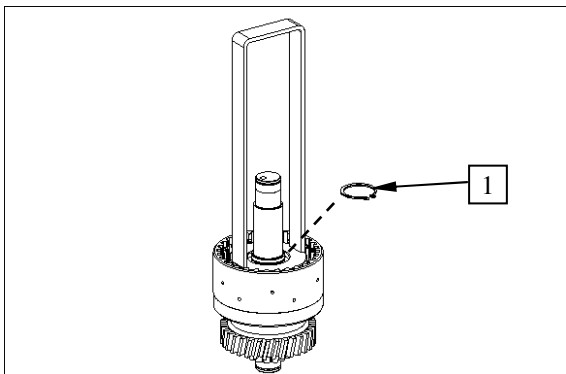


Figure 8

By means of the assembly aid, preload compression spring under a hand-operated press until the retaining ring 40x1.75 (1) can be snapped in.

(S) Assembly aid 5870 345 114

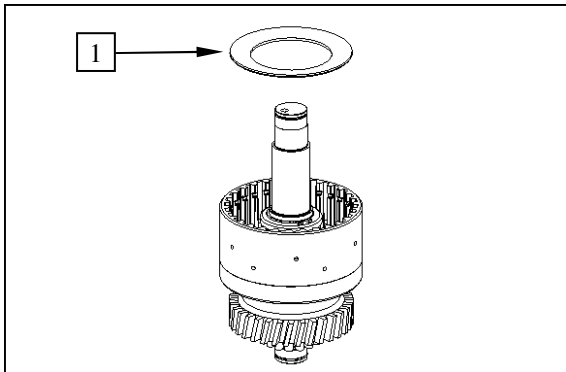


Figure 9

Mount cup spring 112x75x2.55 (1) with the convex side showing towards the piston.



Installation position of cup spring see also Figure 10!

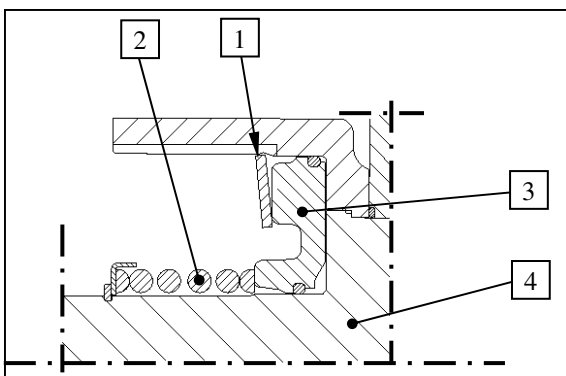


Figure 10

Install cup spring (1) according to the sketch.

Legend:

- 1 = Cup spring 112x75x2.55 (convex side showing towards the piston)
- 2 = Compression spring with spring cup and retaining ring
- 3 = Piston with O-rings
- 4 = Clutch assy

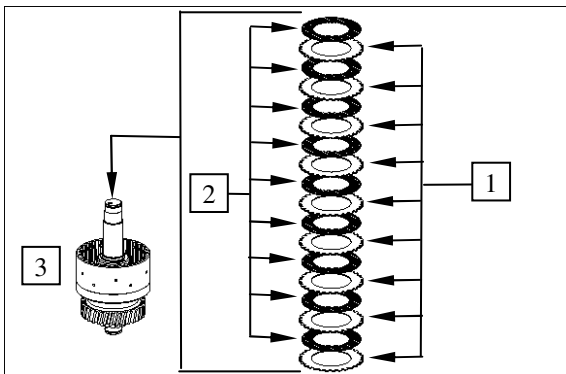


Figure 11

Install outer and inner disks alternately into the disk carrier (3) as shown in Figure 11,

starting with an outer disk and ending with an inner disk.

Legend:

- 1 = Outer disks (9 pcs)
- 2 = Inner disks (9 pcs)
- 3 = Clutch assy

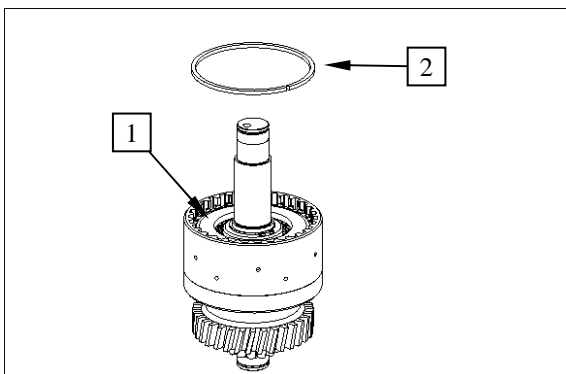


Figure 12

Mount end plate (1) with the flat side showing towards the disk package and fix it by means of snap ring (2) (e.g. thickness = 2.5 mm / recommended value).



Pay attention to the installation position of the end plate!

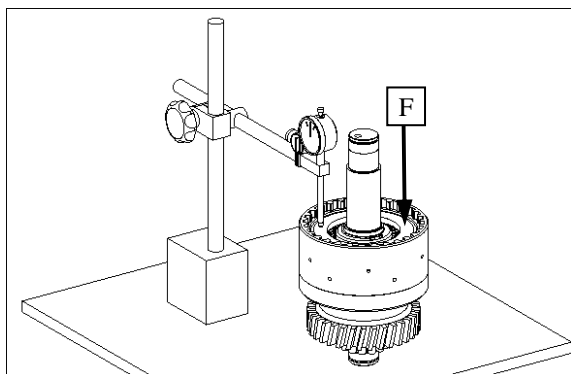


Figure 13

Equally press on end plate with F (approx. 18 N to 20 N = 1.8 kg to 2.0 kg) and set dial indicator to "zero".

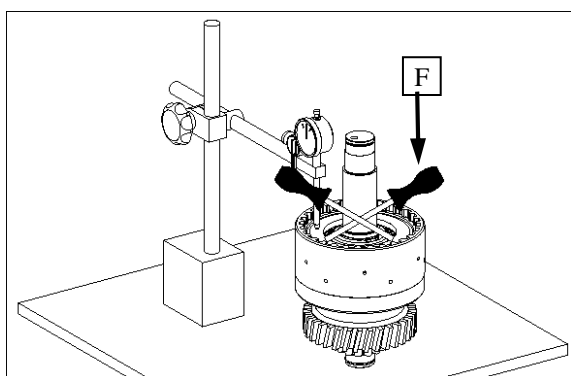


Figure 14

Then press end plate against the snap ring (upwards) and read the disk clearance.



Disk clearance: 1.8 to 2.1 mm!



In case of deviations, the disk clearance must be corrected with an appropriate snap ring (optional thickness = 2.0 ... 3.5 mm/available in steps of 0.25 mm)!

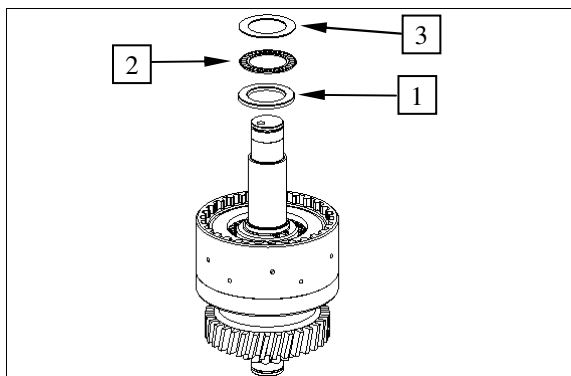


Figure 15

Mount running disk 35x52x3.5 (1), axial needle cage 35x52x2 (2) and axial washer 35x52x1 (3) and oil them.



Mount running disk (1) with the chamfer showing towards the retaining ring!

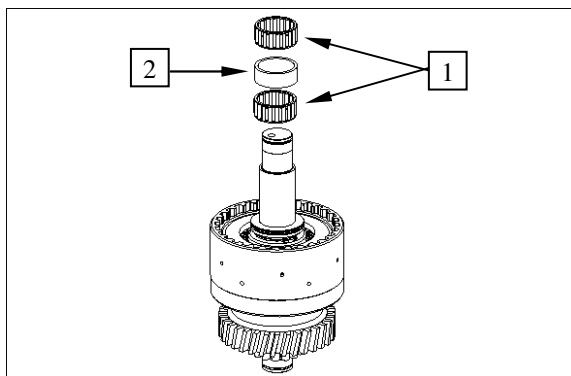


Figure 16

Mount needle cage 35x42x18 (1) and bushing (2) and oil them.

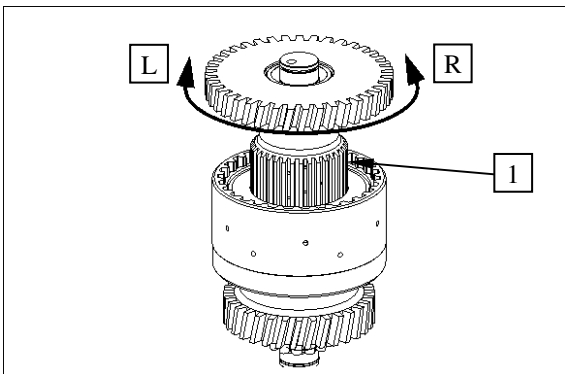


Figure 17

Mount inner disk carrier until contact is obtained.

Install inner disks by short ccw/cw rotations of the inner disk carrier (1).

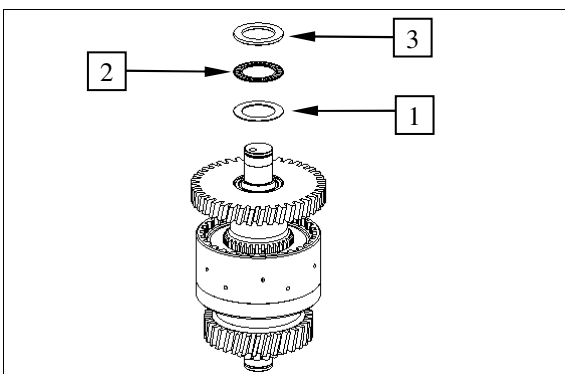


Figure 18

Mount axial washer 35x52x1 (1), axial needle cage 35x52x2 (2) and running disk (3) 35x52x3.5 and oil them.



Mount running disk (3), with the chamfer showing towards the tapered roller bearing!

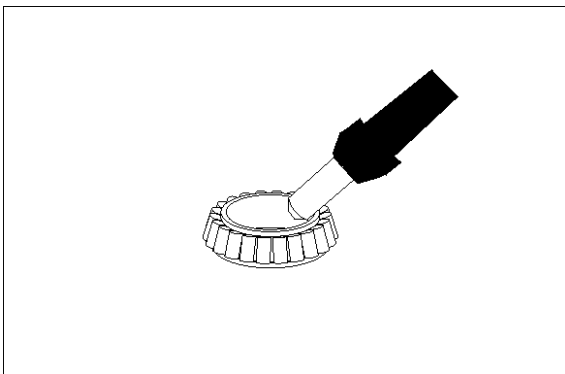


Figure 19

Heat up bearing inner ring (approx. 120° C).

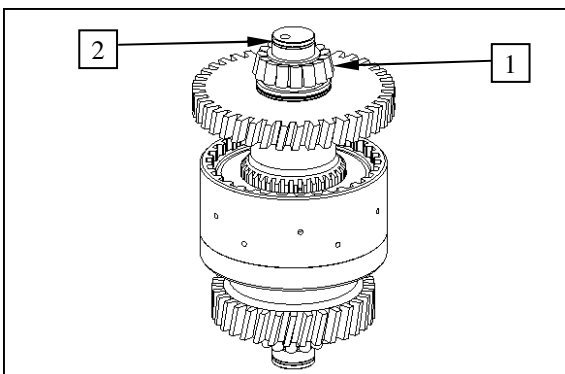


Figure 20

Mount bearing inner ring (1) until contact is obtained.

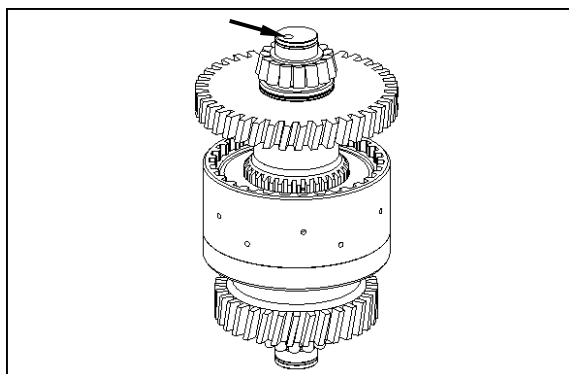
Fit rectangular ring 30x2 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling-down.



Check closing and opening of the clutch by means of compressed air at the hole (see arrow).
Closing and opening of the clutch must be clearly audible.

Figure 21

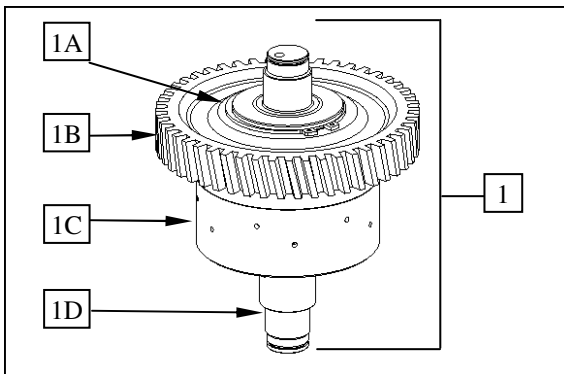


Figure 1

6.6 K4 clutch



The clutch (1) is supplied by the spare parts service only as a complete assy which consists of:

- 1A = Retaining ring
- 1B = Helical gear
- 1C = Disk carrier
- 1D = Shaft

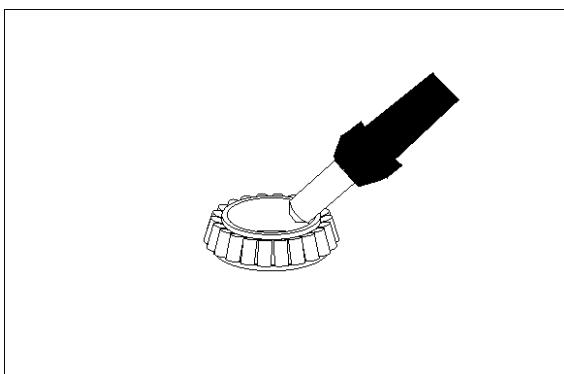


Figure 2

Heat up bearing inner ring (approx. 120° C).

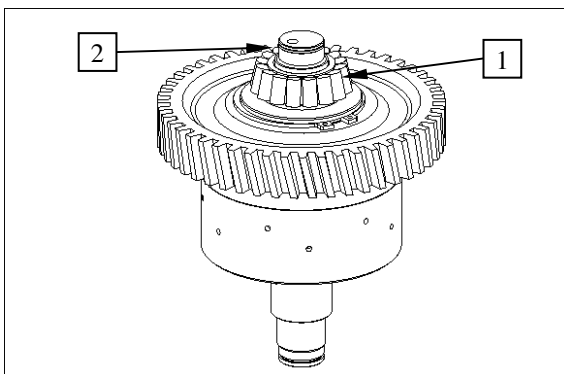


Figure 3

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling-down.

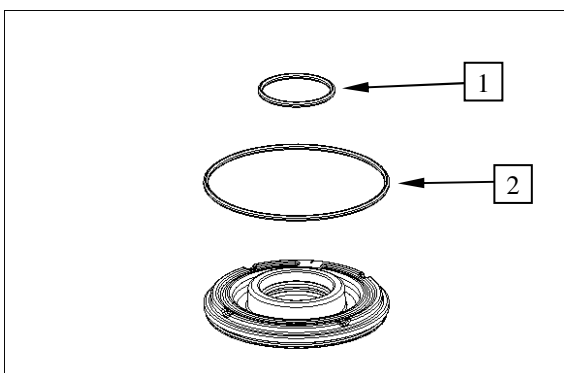


Figure 4

Insert both O-rings (1 and 2) into the piston grooves and oil them.

- 1 = 40x3
- 2 = 104.5x3

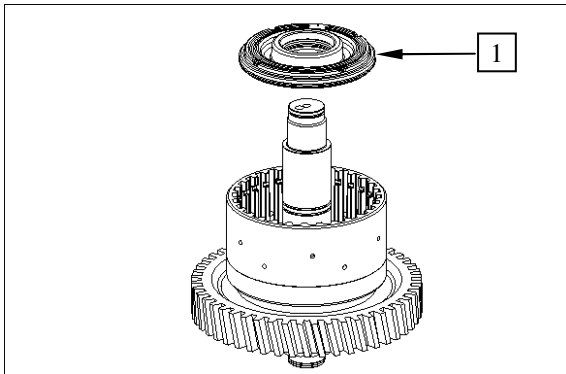


Figure 5

Insert piston (1) into the disk carrier.



Pay attention to the installation position, see Figure!

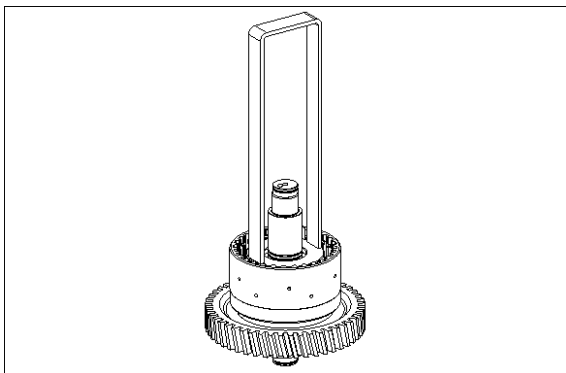


Figure 6

Use a hand-operated press to place piston into the disk carrier by means of the assembly aid.

(S) Assembly aid

5870 345 114

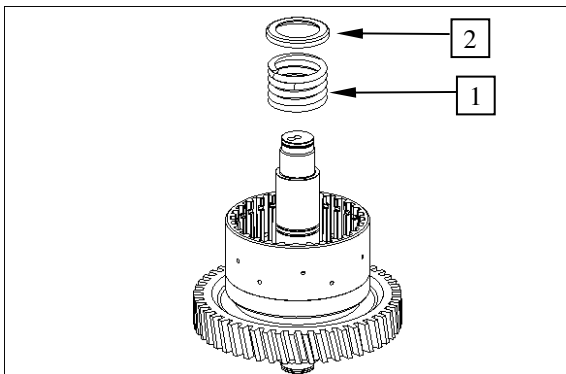


Figure 7

Mount compression spring (1) and spring cup (2).

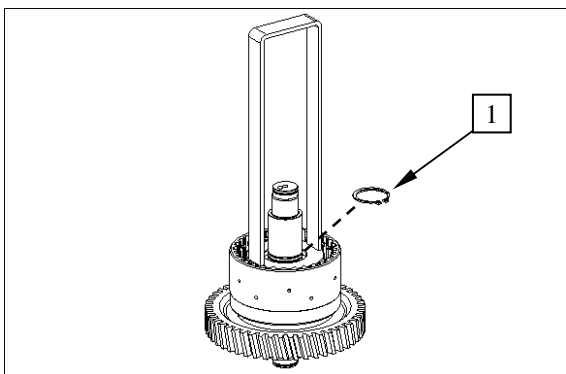


Figure 8

By means of the assembly aid, preload compression spring under a hand-operated press until the retaining ring 40x1.75 (1) can be snapped in.

(S) Assembly aid

5870 345 114

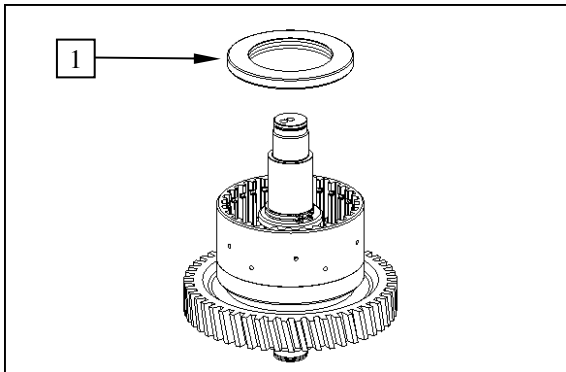


Figure 9

Mount plate assy with cup springs (1), with the open side showing towards the piston.

 **Installation position of plate see also Figure 10!**

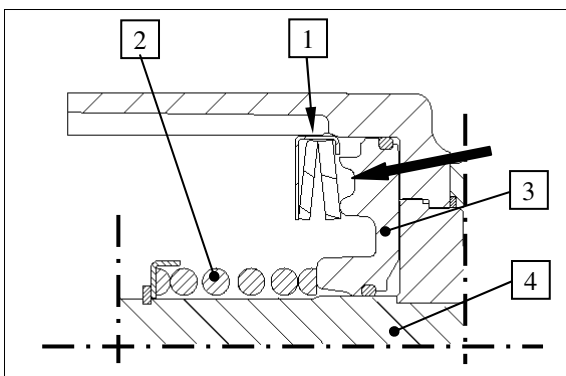


Figure 10

Fit plate (1) according to sketch (see arrow).

Legend:

- 1 = Plate assy with cup springs
- 2 = Compression spring with spring cup and retaining ring
- 3 = Piston with O-rings
- 4 = Input shaft assy

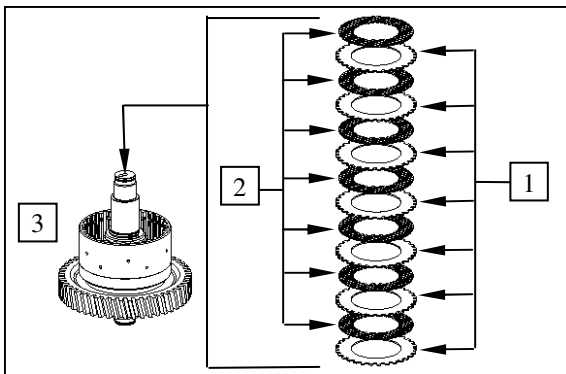


Figure 11

Install outer and inner disks alternately into the disk carrier (3) as shown in Figure 11,

starting with an outer disk and ending with an inner disk.

Legend:

- 1 = Outer disks (7 pcs)
- 2 = Inner disks (7 pcs)
- 3 = Clutch assy

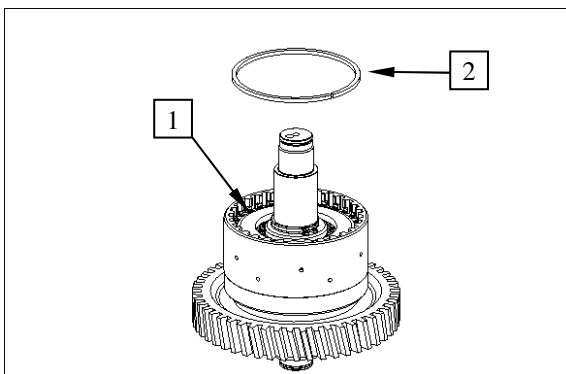


Figure 12

Mount end plate (1) with the flat side showing towards the disk package and fix it by means of snap ring (2) (e.g. thickness = 2.5 mm / recommended value).

 **Pay attention to the installation position of the end plate!**

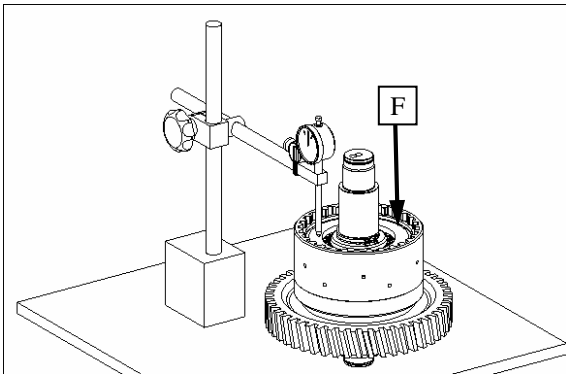


Figure 13

Equally press on end plate with F (approx. 18 N to 20 N = 1.8 kg to 2.0 kg) and set dial indicator to "zero".

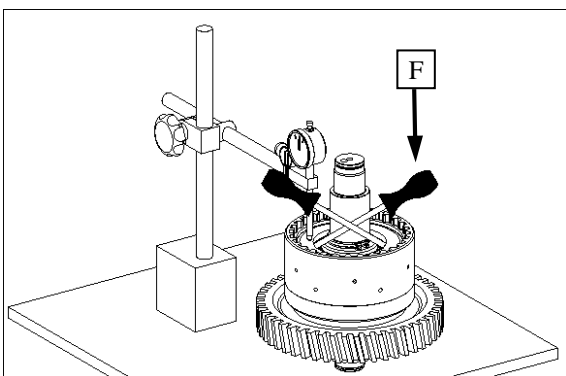


Figure 14

Then press end plate against the snap ring (upwards) and read the disk clearance.

 **Disk clearance: 1.4 to 1.7 mm!**

 **In case of deviations, the disk clearance must be corrected with an appropriate snap ring (optional thickness = 2.0 ... 3.5 mm/available in steps of 0.25 mm)!**

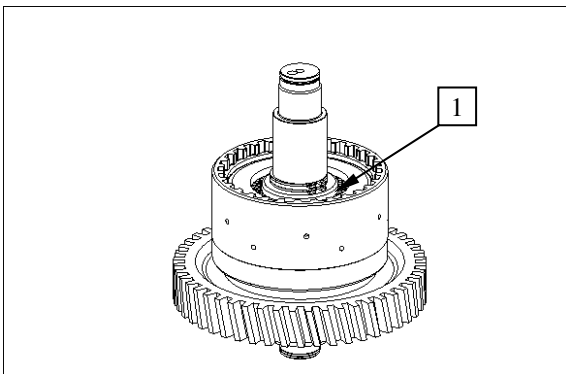


Figure 15

Snap retaining ring 40x1.75 (1) into the groove.

 **Contact for axial bearing - see Figure 16!**

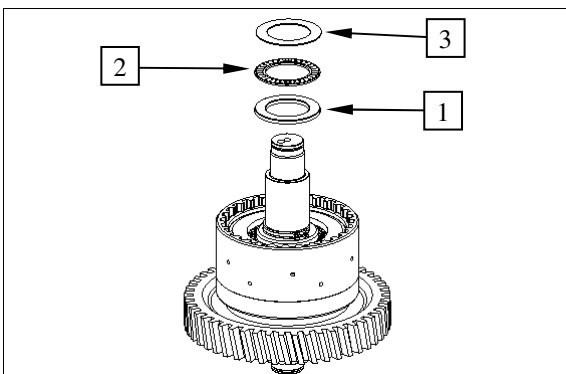


Figure 16

Mount running disk 40x60x3.5 (1), axial needle cage 40x60x3 (2) and axial washer 40x60x1 (3) and oil them.

 **Mount running disk (1) with the chamfer showing towards the retaining ring!**

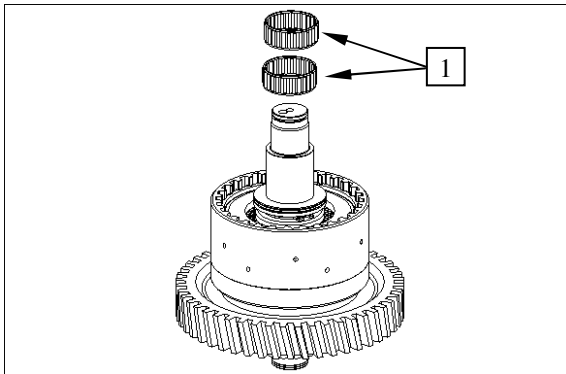


Figure 17

Mount needle cage 40x45x17 (1) and oil it.

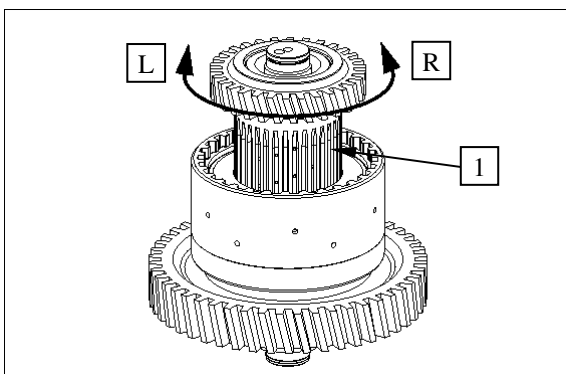


Figure 18

Mount inner disk carrier until contact is obtained.

Install inner disks by short ccw/cw rotations of the inner disk carrier (1).

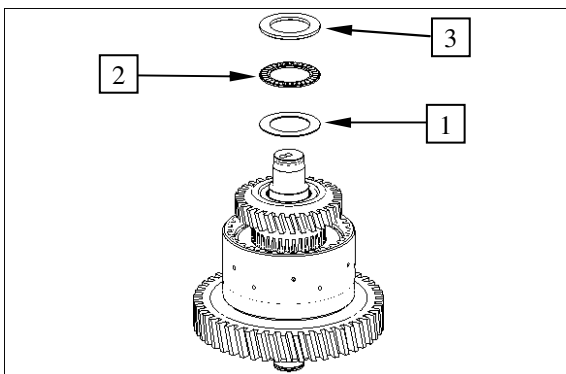


Figure 19

Mount axial washer 40x60x1 (1), axial needle cage 40x60x3 (2) and running disk (3) 40x60x3.5 and oil them.



Mount running disk (3), with the chamfer showing towards the tapered roller bearing!

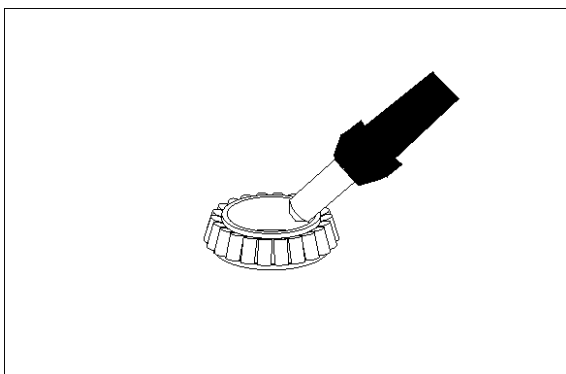


Figure 20

Heat up bearing inner ring (approx. 120° C).

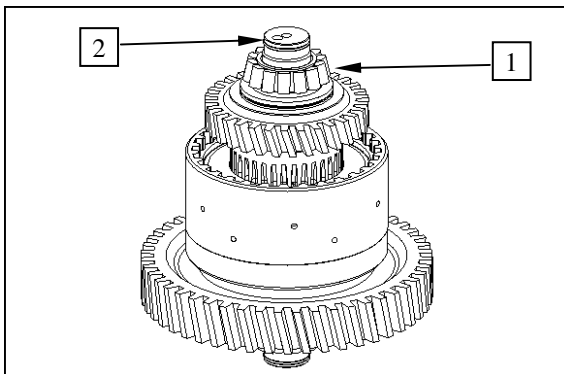


Figure 21

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling-down!

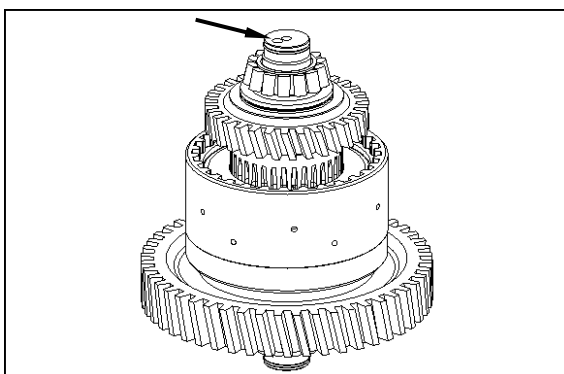


Figure 22



**Check closing and opening of the clutch by means of compressed air at the hole (see arrow).
Closing and opening of the clutch must be clearly audible.**

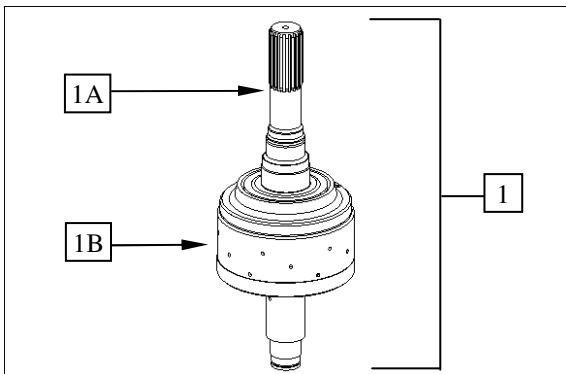


Figure 1

6.7 Front wheel drive (VA)

The clutch (1) is supplied by the spare parts service only as a complete assy which consists of:

1A = Shaft

1B = Disk carrier

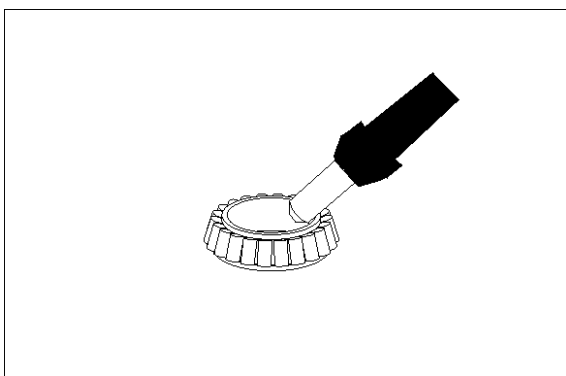


Figure 2

Heat up bearing inner ring (approx. 120° C).

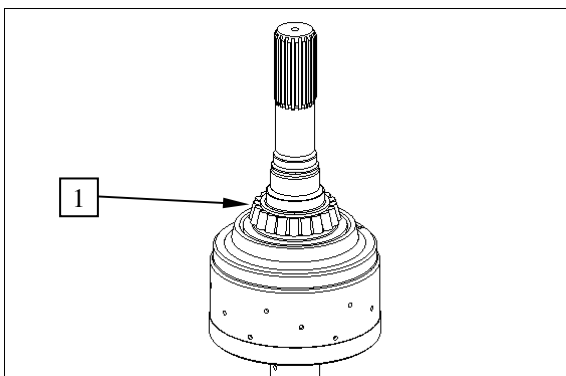


Figure 3

Mount bearing inner ring (1) until contact is obtained.



Wear protective gloves!



Adjust bearing inner ring after cooling-down!

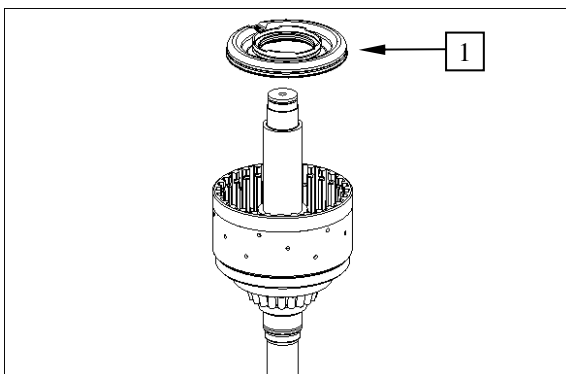


Figure 4

Insert piston (1) into the disk carrier.



Oil both sealing lips!



Pay attention to the installation position, see Figure!

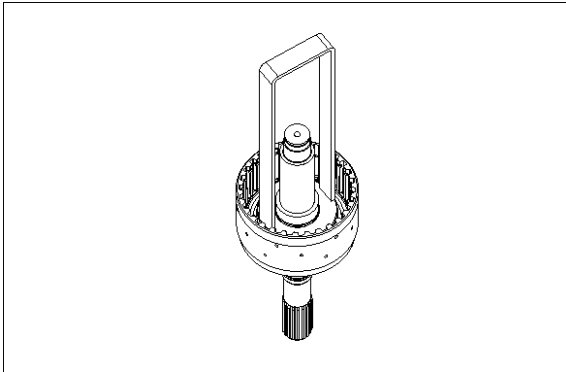


Figure 5

Use a hand-operated press to place piston into the disk carrier by means of the assembly aid.

(S) Assembly aid

5870 345 114

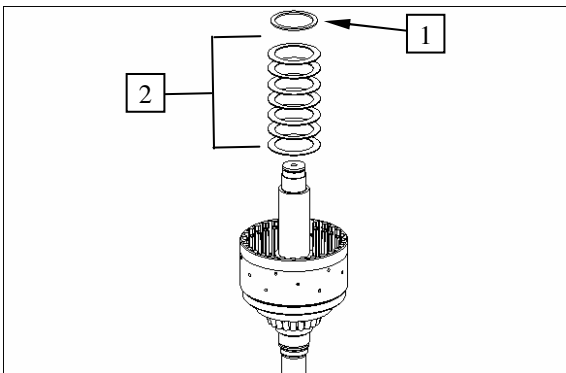


Figure 6

Mount cup spring package (1) and washer (2).

👉 Installation position of cup springs see Figure 7!

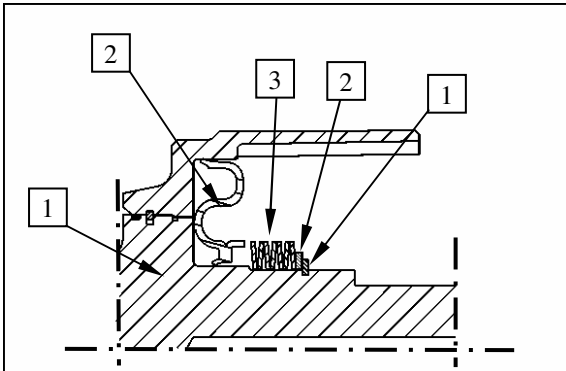


Figure 7

Fit cup springs according to the sketch.

Legend:

1 = Clutch

2 = Piston

3 = Cup springs (7 pcs)

4 = Washer

5 = Retaining ring (50x2)

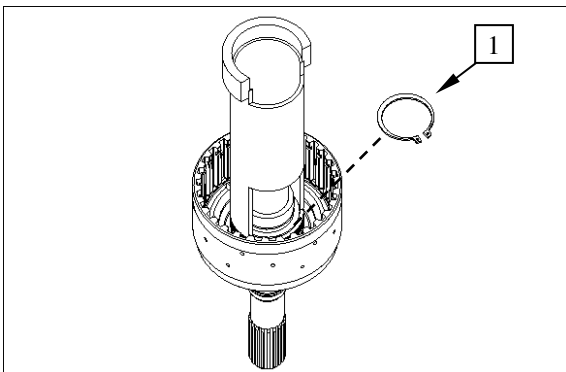


Figure 8

By means of the assembly aid, preload cup springs under a hand-operated press until the retaining ring 50x2 (1) can be snapped in.

(S) Assembly aid

5870 506 128

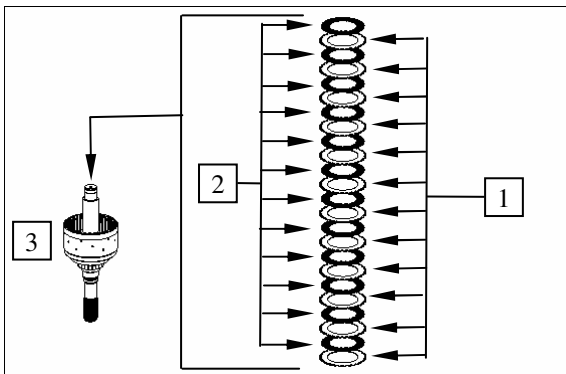


Figure 9

Install outer and inner disks alternately into the disk carrier (3) as shown in Figure 9,

starting with an outer disk and ending with an inner disk.

Legend:

- 1 = Outer disks (12 pcs)
- 2 = Inner disks (12 pcs)
- 3 = Clutch assy

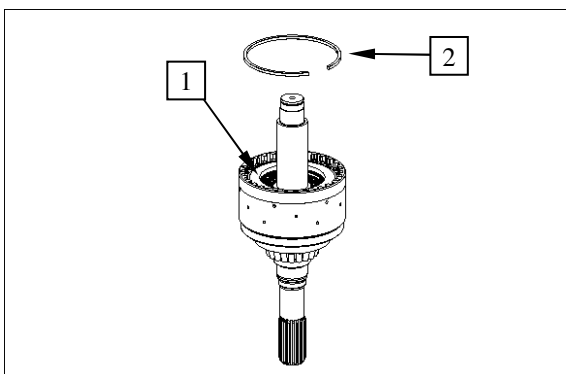


Figure 10

Mount end plate (1) with the flat side showing towards the disk package and fix it by means of snap ring (2) (e.g. thickness = 2.5 mm / recommended value).

Pay attention to the installation position of the end plate!

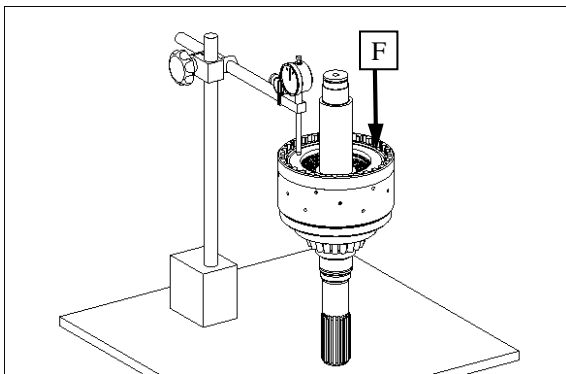


Figure 11

Equally press on end plate with F (approx. 18 N to 20 N = 1.8 kg to 2.0 kg) and set dial indicator to "zero".

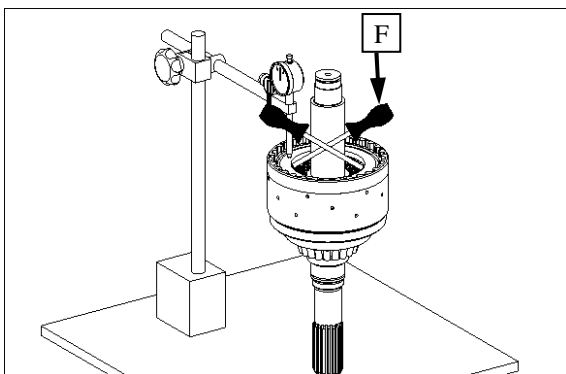


Figure 12

Then press end plate against the snap ring (upwards) and read the disk clearance.

Disk clearance: 2.3 to 2.8 mm!

In case of deviations, the disk clearance must be corrected with an appropriate snap ring (optional thickness = 2.0 ... 4.0 mm/available in steps of 0.25 mm)!

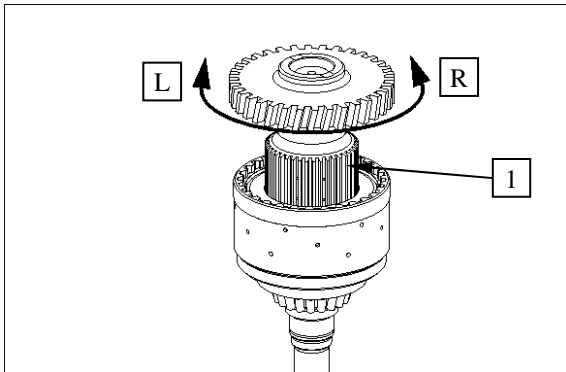


Figure 13

Mount inner disk carrier until contact is obtained.

Install inner disks by short ccw/cw rotations of the inner disk carrier (1).

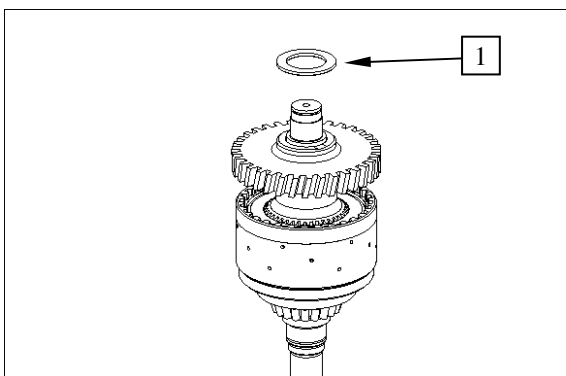


Figure 14

Mount running disk 40x60x3.5 (1).

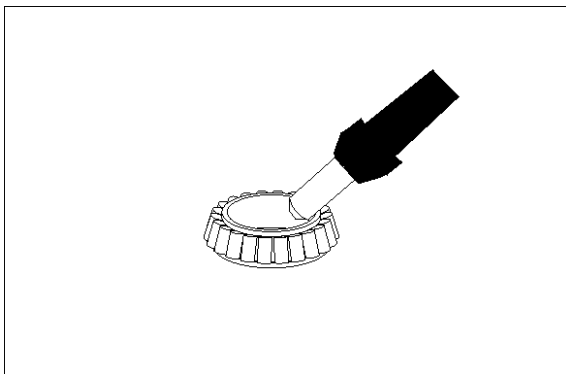


Figure 15

Heat up bearing inner ring (approx. 120° C).

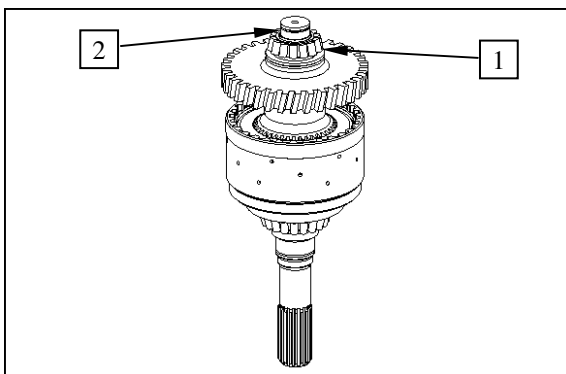


Figure 16

Mount bearing inner ring (1) until contact is obtained.

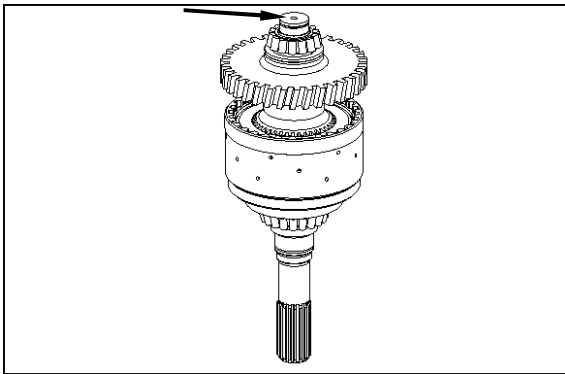
Fit rectangular ring 30x2 (2).



Wear protective gloves!



Adjust bearing inner ring after cooling-down.



☞ Check closing and opening of the clutch by means of compressed air at the hole (see arrow).
Closing and opening of the clutch must be clearly audible.

Figure 17

7. Reinstallation and reassembly of transmission pump, oil suction tube and oil filler tube, control pressure and converter safety valve, coarse filter and clutches

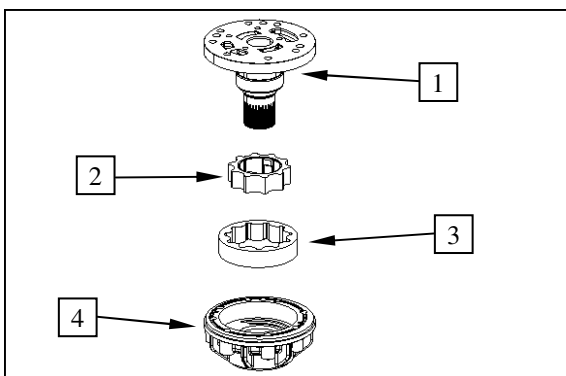


Figure 1

7.1 Reassembly of transmission pump

In case of wear marks in the pump housing, stator hollow shaft, inner rotor, outer rotor and on the sliding bearing, the pump assy must be replaced.

Legend:

- 1 = Stator hollow shaft
- 2 = Inner rotor
- 3 = Outer rotor
- 4 = Pump housing with sliding bearing

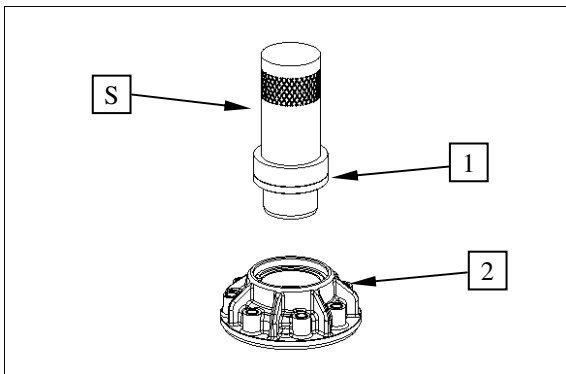


Figure 2

With the sealing lip showing downwards, carefully insert the shaft seal 55x75x8 (1) into the pump housing (2) until contact is obtained.

Outer diameter:

- if rubber-coated: wet with spirit
- if made of metal: apply sealing agent Loctite No. 574!

(S) Driver tool 5870 048 219

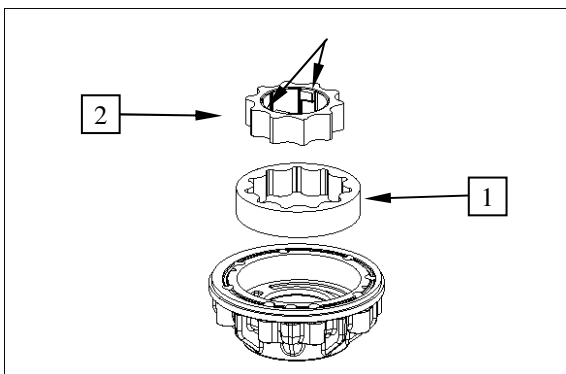


Figure 3

Fit outer rotor (1) and inner rotor (2).

The driver pins of the inner rotor (see arrows) are to be fitted in upward direction.

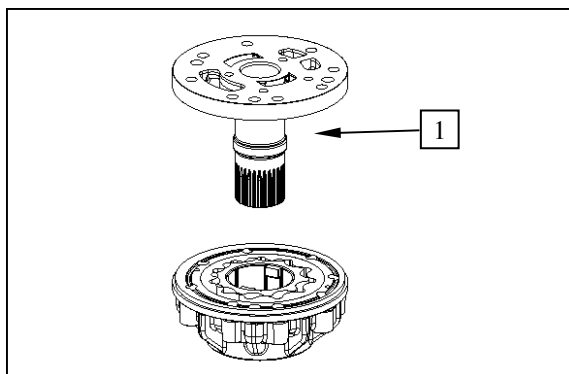


Figure 4

Fit stator hollow shaft (1).

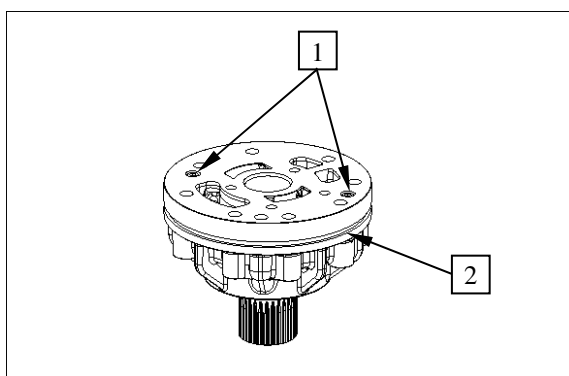


Figure 5

Fix stator hollow shaft radially with two cylindrical screws (1).



Do not tighten the cylindrical screws – just turn them in until contact is obtained and then turn them back by approx. ½ rotation!

Place O-ring (2) 135x3 into the annular groove and grease it.

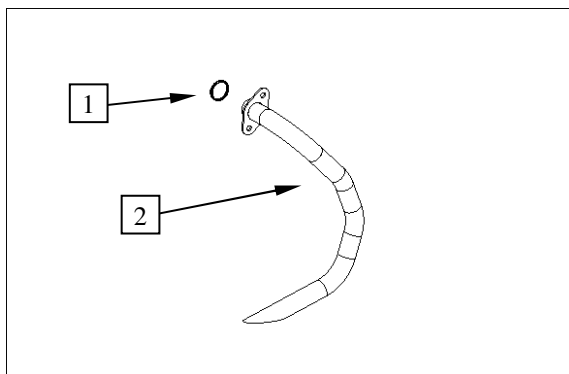


Figure 6

7.2 Oil suction tube and oil filler tube

Mount O-ring 30x3 (1) onto the suction tube (2) and grease it.

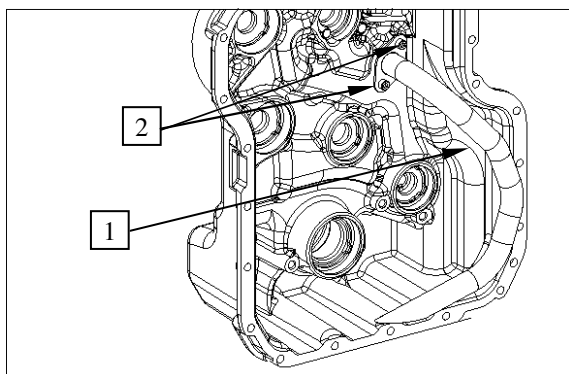


Figure 7

Fix suction tube (1) with cylindrical screws M8x16 (2).

Tightening torque M8/8.8x16..... $M_A = 23 \text{ Nm}$



When reusing the cylindrical screws these must be secured with Loctite 243!



New cylindrical screws are already provided with adhesive (microcapsule). The microcapsule bursts when the screw is turned in, wets screw and nut thread and hardens.

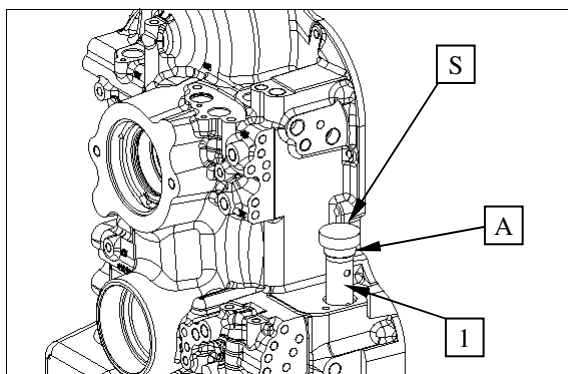


Figure 8

Insert tube (1) into the transmission housing by means of driver tool (S).

(S) Driver tool 5870 048 309

Use the driver tool to obtain the correct offset!

Apply Loctite (type No. 574) onto the surface (A)!

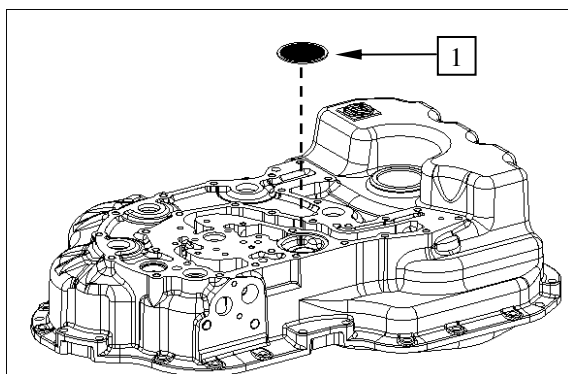


Figure 9

7.3 Coarse filter

Insert filter (1).

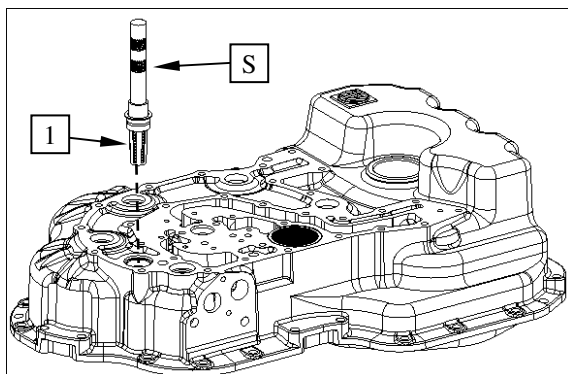


Figure 10

7.4 Reinstallation of converter safety valve

Insert valve (1) with drift (S) into the housing until contact is obtained.

(S) Drift 5870 705 012

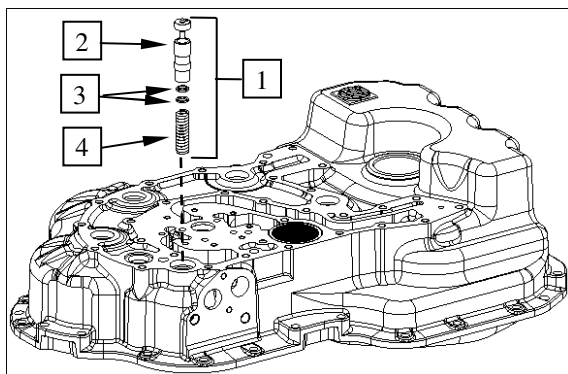


Figure 11

7.5 Reassembly of main pressure valve (control pressure valve)

Insert main pressure valve (1).

Main pressure valve consists of:

2 = Piston

3 = Spacer ring (2 pcs)

recommended value 5 mm

4 = Compression spring

The main pressure 16 + 3 bar is determined by means of the spacer rings!

Gradation of available spacer rings see spare parts list.

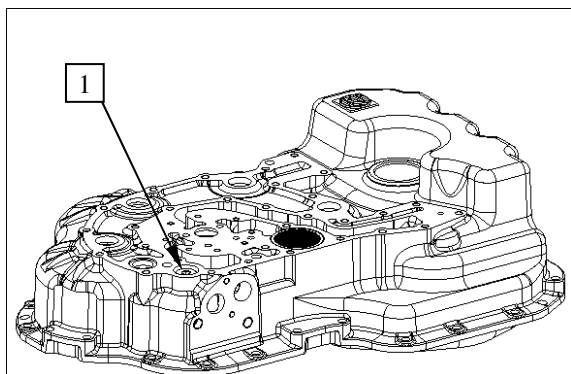


Figure 12

Fit screw plug M22x1.5 (1) with O-ring 19x2.

Tightening torque $M_A = 50 \text{ Nm}$

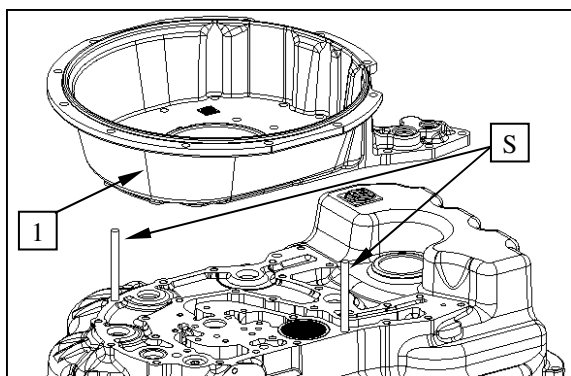


Figure 13

7.6 Reinstallation of transmission pump

☞ Fit two adjusting screws (S) and position converter bellhousing (1) equally until contact is obtained.

☞ Pay attention to the hole pattern!

☞ Wet mounting face with Loctite (type No. 574)!

(S) Adjusting screws (M10) 5870 204 007

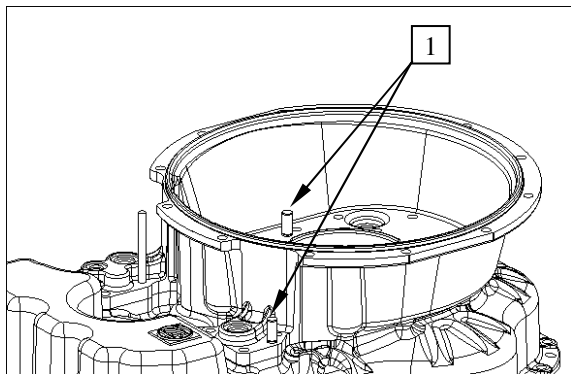


Figure 14

Force the cylindrical pins 12x24 (1) into the holes (blind holes) until contact is obtained.

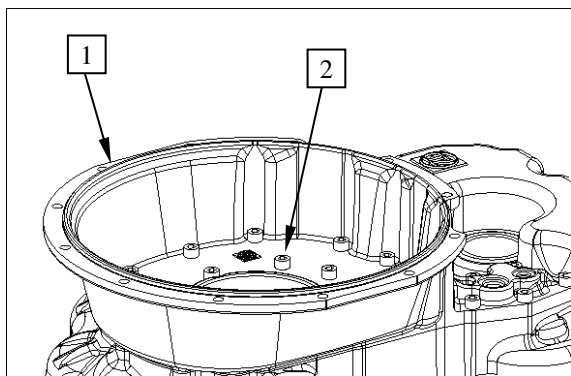


Figure 15

Fix converter bellhousing (1) with cylindrical screws M10x30 (2).

Tightening torque (M10/8.8x30) $M_A = 46 \text{ Nm}$

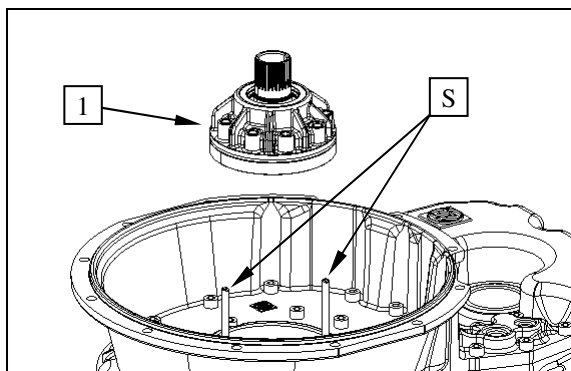


Figure 16

Fit two adjusting screws (S) and mount preassembled pump (1).

Pay attention to the hole pattern!

(S) Adjusting screws (M8) 5870 204 011

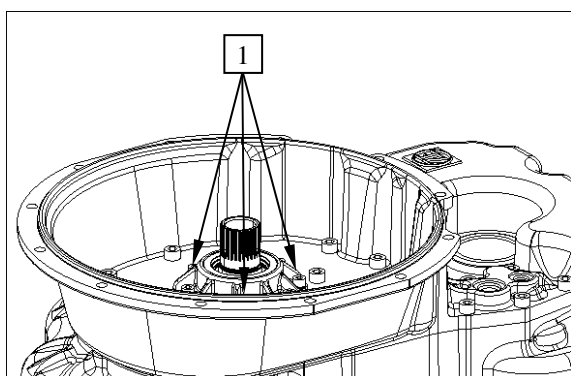


Figure 17

Position transmission pump with 3 cylindrical screws (1) M8x60 (3x120° offset position) equally until contact is obtained.

ATTENTION: Do not damage (shear off) the O-ring!

Fix transmission pump with cylindrical screws M8x60 (1).

Tightening torque (M8/8.8x60) $M_A = 23 \text{ Nm}$

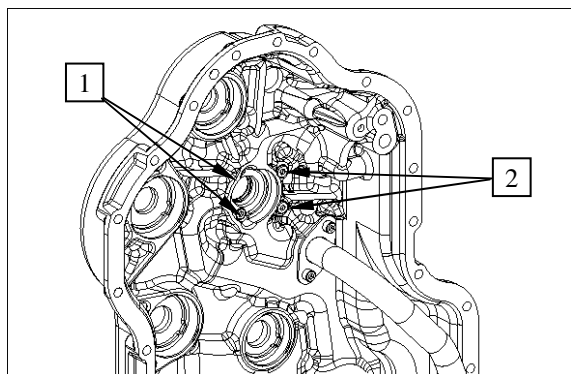


Figure 18

Fix pump with cylindrical screws (1 and 2).

1 = M8x16

2 = M8x35

Tightening torque M8/8.8x16..... $M_A = 23 \text{ Nm}$

Tightening torque M8/8.8x35..... $M_A = 23 \text{ Nm}$

New cylindrical screws are to be fitted on a general basis.

These cylindrical screws are already provided with adhesive (microcapsule).

The microcapsule bursts when the screw is turned in, wets screw and nut thread and hardens.

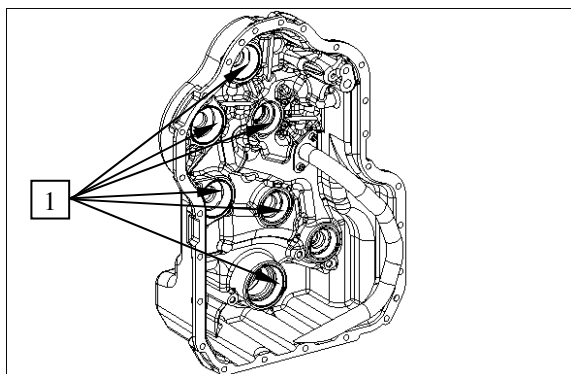


Figure 19

7.7 Reinstallation of clutches

Insert all bearing outer rings (1) into the bearing holes of both housing parts (see Figures 19 and 20).

Place bearing outer rings into the bearing holes using assembly grease.

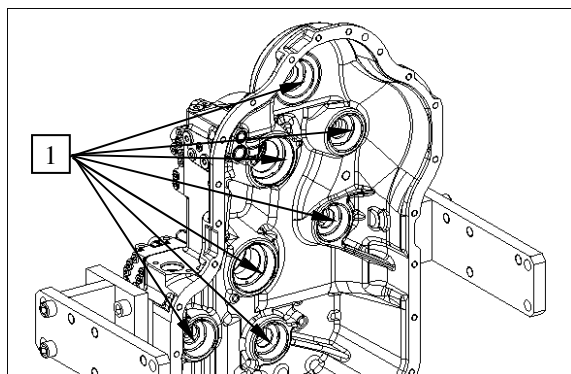


Figure 20

☞ If, contrary to the ZF recommendation, the tapered roller bearings of clutches and input are not replaced, it is imperative to ensure the previous pairing (bearing inner ring/bearing outer ring) - see Chapter 4, Figures 11 and 12!

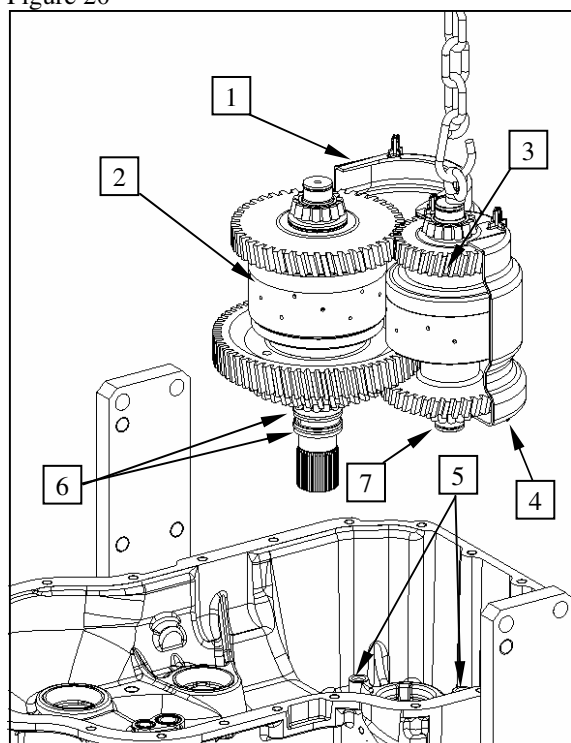


Figure 21

Reinstallation of K2 and K3 (Version without front wheel drive)

Align rectangular rings 50x2,5 (6) and rectangular ring 30x2 (7) and grease them.

Hold K3 clutch (3) by means of the lifting device, position K2 clutch (2) and screen sheet (1) at K3 clutch (3), and then jointly insert the assembly.

(S) Eyebolts 5870 204 080

☞ Bolts (4) of the screen sheet must be fixed into the pilot holes (5)!

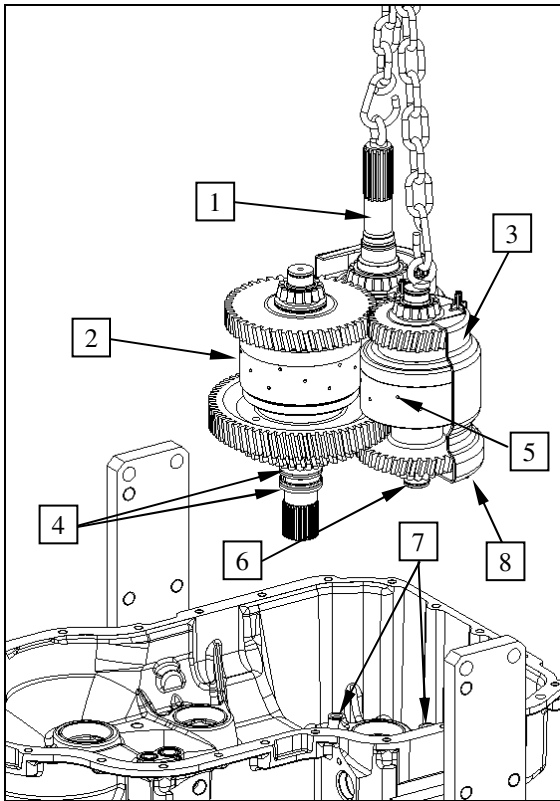


Figure 22

Reinstallation of K2, K3 and front wheel drive (Version with front wheel drive)

Align and grease rectangular rings 50x2,5 (4) and rectangular rings 30x2 (6), as well as those of the front wheel drive.

Hold K3 clutch (5) and front wheel drive (1) by means of the lifting device, position K2 clutch (2) and screen sheet (3) at K3 clutch (5), and then jointly insert the assembly.

(S) Eyebolts 5870 204 080

👉 Bolts (8) of the screen sheet must be fixed into the pilot holes (7)!

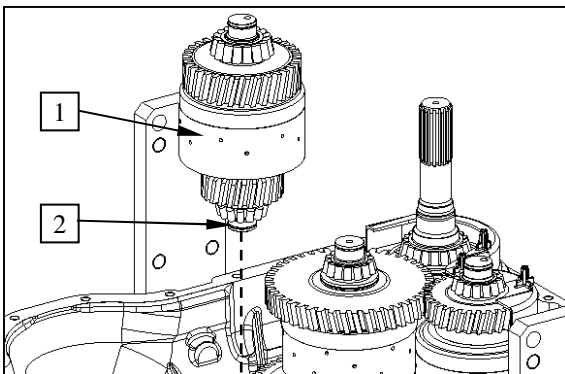


Figure 23

Reinstallation of K1

Align and grease rectangular ring 30x2 (2).

Position K1 clutch (1).

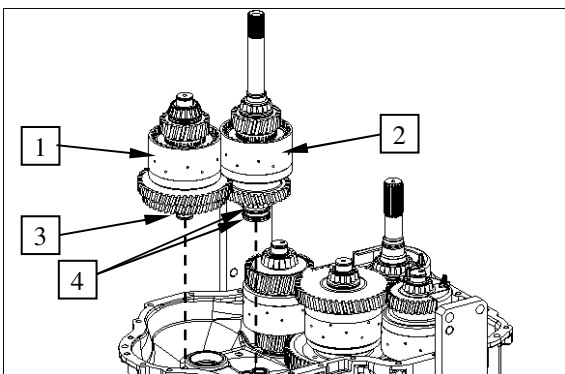


Figure 24

Reinstallation of KV and KR

Align and grease rectangular rings 50x2 (4) and rectangular ring 30x2 (3).

Jointly position KV clutch (1) and KR clutch (2).

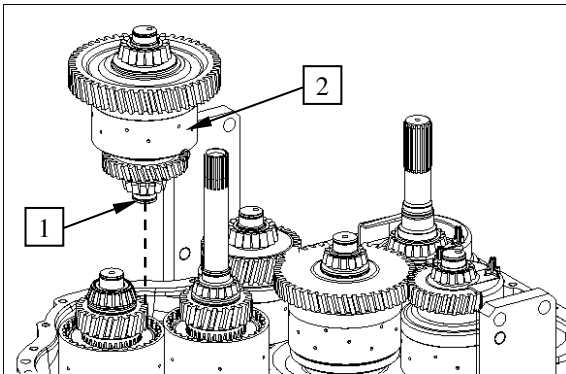


Figure 25

Reinstallation of K4

Align and grease rectangular ring 30x2 (1).

Position K4 clutch (2).

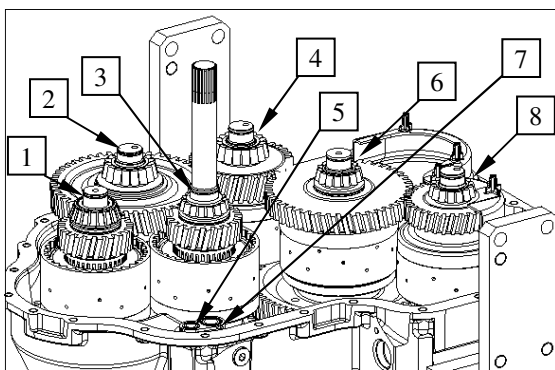


Figure 26

Version without front wheel drive:

Place O-rings (5 and 7) into the hole and grease them.
Align and grease rectangular rings (1, 2, 3, 4, 6 and 8).

- 1 = Rectangular ring 30x2 (KV clutch)
- 2 = Rectangular ring 30x2 (K4 clutch)
- 3 = Rectangular ring 35x2 (KR clutch)
- 4 = Rectangular ring 30x2 (K1 clutch)
- 5 = O-Ring 15x2
- 6 = Rectangular ring 30x2 (K2 clutch)
- 7 = O-Ring 21.89x2.62
- 8 = Rectangular ring 30x2 (K3 clutch)

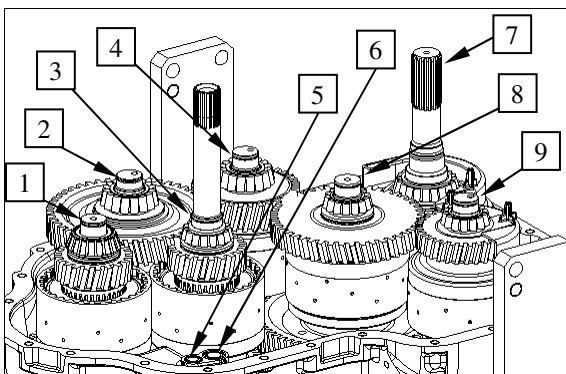


Figure 27

Version with front wheel drive:

Place O-rings (5 and 6) into the hole and grease them.
Align and grease rectangular rings (1, 2, 3, 4, 8 and 9).

- 1 = Rectangular ring 30x2 (KV clutch)
- 2 = Rectangular ring 30x2 (K4 clutch)
- 3 = Rectangular ring 35x2 (KR clutch)
- 4 = Rectangular ring 30x2 (K1 clutch)
- 5 = O-ring 15x2
- 6 = O-ring 21.89x2.62
- 7 = ----- (front wheel drives)
- 8 = Rectangular ring 30x2 (K2 clutch)
- 9 = Rectangular ring 30x2 (K3 clutch)

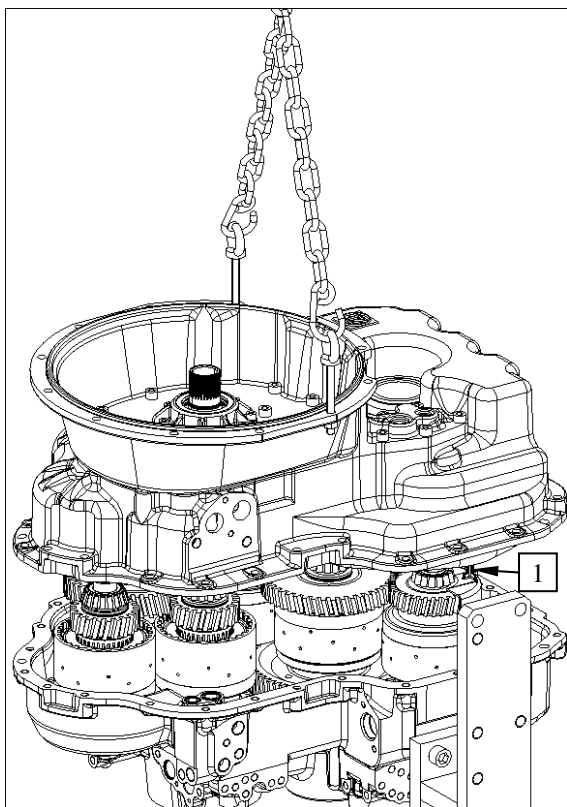


Figure 28

Use the lifting device to carefully bring the transmission housing front part into contact position.

 Bolts (1) of the screen sheet must be fixed into the pilot holes!

 Wet mounting face with Loctite (type N. 574)!

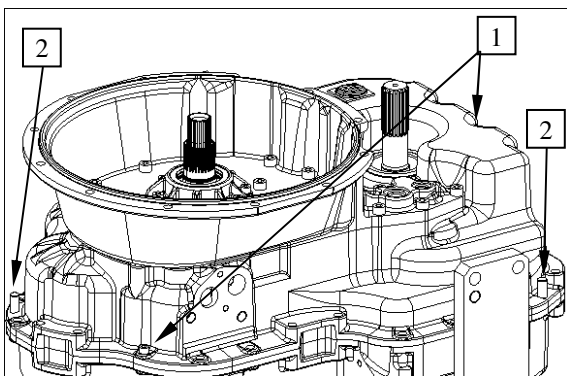


Figure 29

Hand-tighten the transmission housings crosswise with 2 cylindrical screws (1).

Fit cylindrical pins 12x24 (2) centrically to the mounting face.

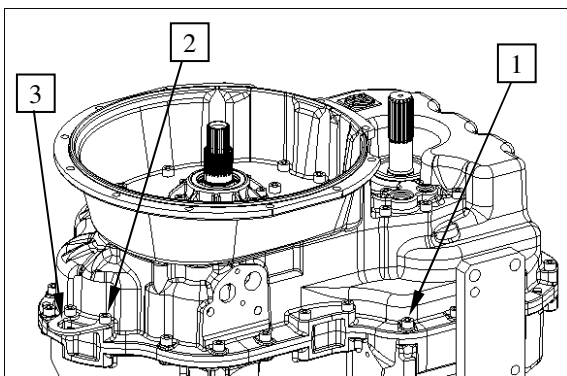


Figure 30

Fix transmission housing front and rear part by means of cylindrical screws (1 and 2).

Fit bracket (3).

Cylindrical screw (1) M10x30 (14x)

Cylindrical screw (2) M10x50 (10x)

Tightening torque M10/8.8x30 $M_A = 46 \text{ Nm}$

Tightening torque M10/8.8x50 $M_A = 46 \text{ Nm}$

8. Reassembly of rear axle output flange and screw plug at measuring point „63“ after the converter, and sealing of version with and without front wheel drive

8.1 Reassembly of rear axle output flange

Use driver tool (S) to fit the shaft seal 60x90x8 (1) until contact position, with the sealing lip showing towards the oil sump (see Figure 2).

(S) Driver tool 5870 048 200

☞ Fill space between sealing lip and dust lip with grease!

☞ Wet rubber-coated outer diameter with spirit!

☞ Use the driver tool to obtain the correct offset!

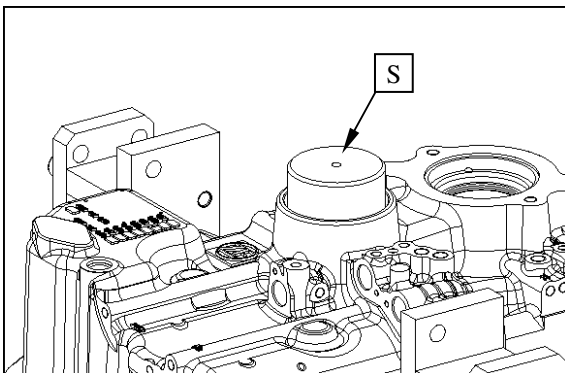


Figure 1

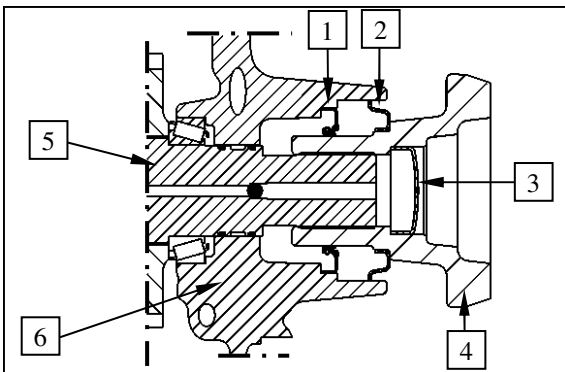


Figure 2

Installation situation - rear axle output

- 1 = Shaft seal 60x90x8
- 2 = Screen sheet
- 3 = Closing cover
- 4 = Output flange
- 5 = K2 clutch shaft
- 6 = Transmission housing

Press closing cover (3) into the flange (4) until contact is obtained (see Figure 2).

☞ Apply Loctite (type No. 518) to the closing cover!

☞ Use suitable pressure piece; closing cover must not be deformed!

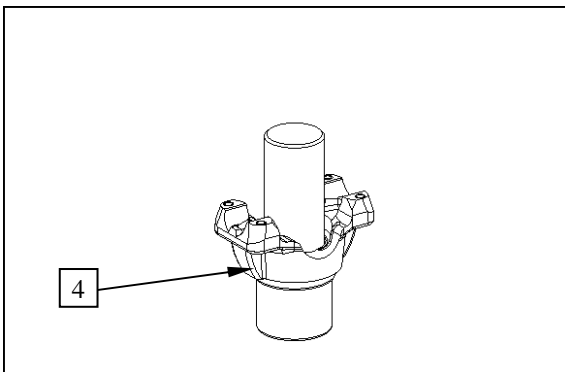


Figure 3

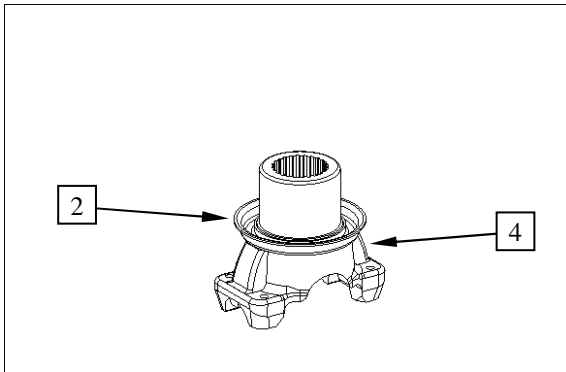


Figure 4

Press screen sheet (2) onto the flange (4) until contact is obtained (see Figure 2).



Use suitable pressure piece; screen sheet must not be deformed!

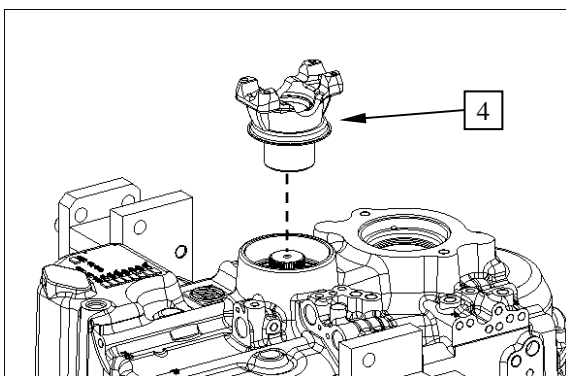


Figure 5

Mount output flange (4) until contact position (see Figure 2).

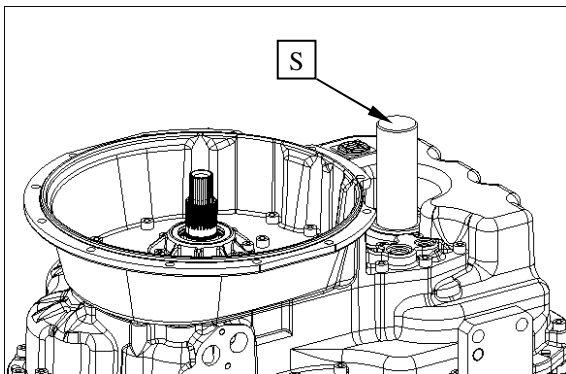


Figure 6

8.2 Sealing of version with front-wheel-drive

Use driver tool (S) to fit the shaft seal 40x62x7 (1) until contact position, with the sealing lip showing towards the oil sump (see Figure 7).

(S) Driver tool 5870 048 310



Fill space between sealing lip and dust lip with grease!



Wet rubber-coated outer diameter with spirit!



Use the driver tool to obtain the correct offset!

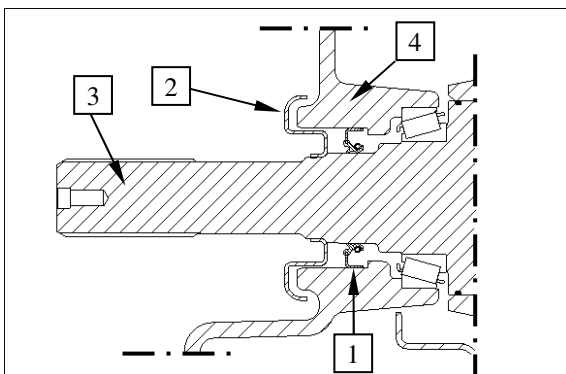


Figure 7

Installation situation - sealing of version with front-wheel-drive

- 1 = Shaft seal 40x62x7
- 2 = Screen sheet
- 3 = VA clutch shaft
- 4 = Transmission housing

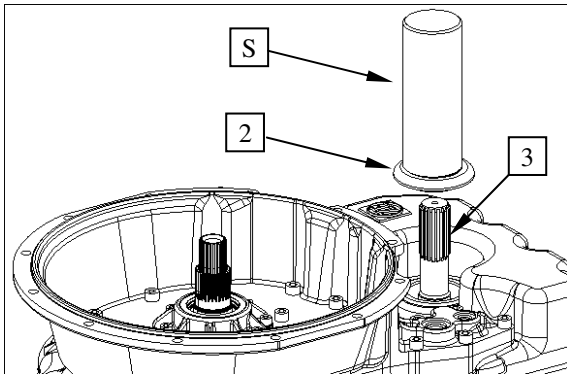


Figure 8

Use the driver tool (S) to install screen sheet (2) onto the VA clutch shaft (3) until contact position (see Figure 7).

(S) Driver tool 5870 048 310

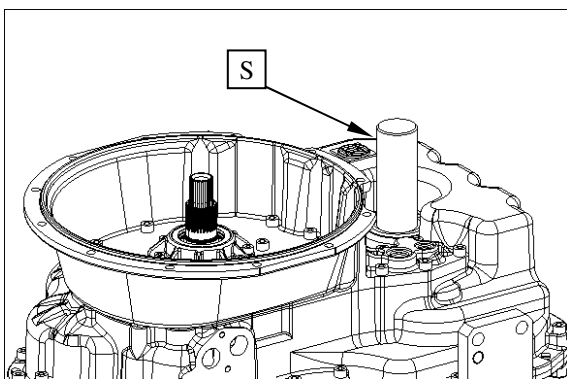


Figure 9

8.3 Sealing of version without front-wheel-drive

Use the driver tool (S) to place screen sheet (1) into the transmission housing (2) until contact is obtained (see Figure 10).

(S) Driver tool 5870 048 310

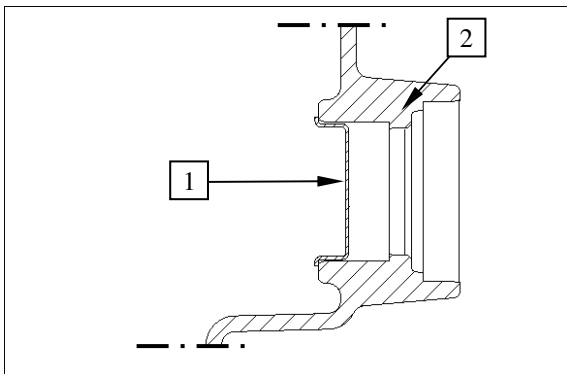


Figure 10

Installation situation - sealing of version without front-wheel-drive

- 1 = Screen sheet
- 2 = Transmission housing

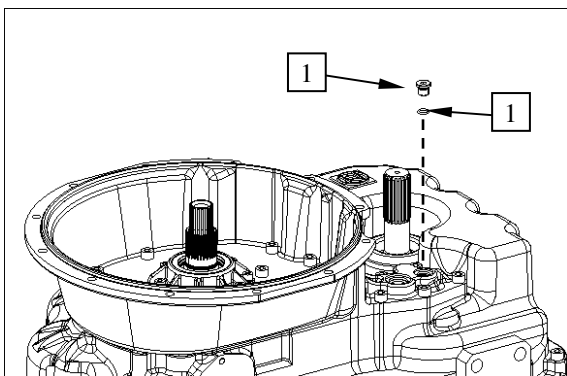


Figure 11

8.4 Reassembly of screw plug at measuring point "63"

Fit screw plug M14x1.5 (1) with new O-ring 11x2 (2).

Tightening torque MA = 25 Nm

9. Reinstallation of nozzles (orifices), screw plugs, solenoid valves, inductive sensor and mounting provision for oil filler tube

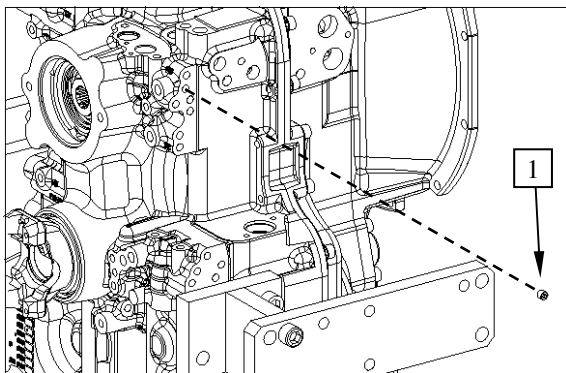


Figure 1

9.1 Reinstallation of nozzles (orifices)

Fit nozzle M10x1 Ø 1.55 (1) for the directional clutches KV, KR and K4.

Tightening torque $M_A = 10 \text{ Nm}$

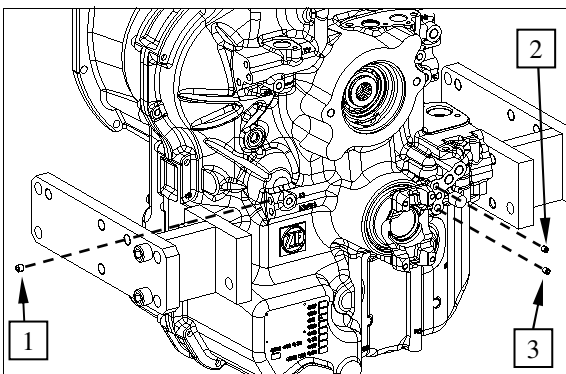


Figure 2

Fit nozzles for the gear clutches K1, K2 and K3.

1 = Nozzle (K1) M10x1 Ø1.4

2 = Nozzle (K2) M8 Ø1.7

3 = Nozzle (K3) M8 Ø1.4

Tightening torque M8 $M_A = 10 \text{ Nm}$

Tightening torque M10x1 $M_A = 10 \text{ Nm}$

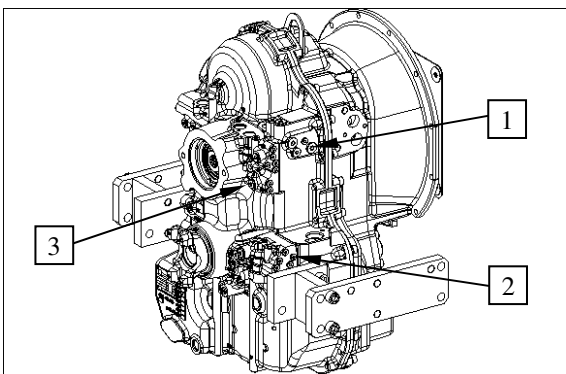


Figure 3

9.2 Reinstallation of screw plugs

Install all screw plugs with O-rings.

1 = Screw plug 3/4 -16 UNF; O-ring 16.36x2.21 (2x)

2 = Screw plug M10x1; O-ring 8x1.5 (36x)

3 = Screw plug 9/16 -18 UNF; O-ring 11.89x1.98 (3x)

Tightening torque 3/4 -16 UNF $M_A = 28 \text{ Nm}$

Tightening torque M10x1 $M_A = 6 \text{ Nm}$

Tightening torque 9/16 -18 UNF $M_A = 35 \text{ Nm}$

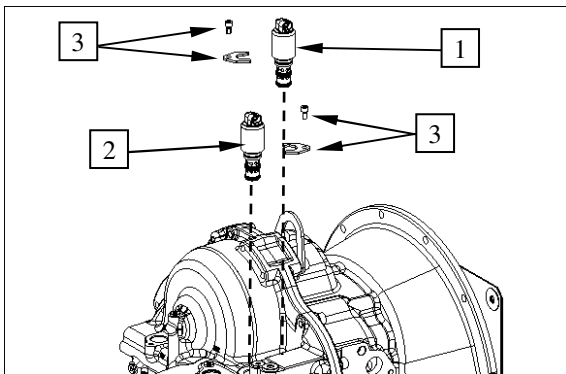


Figure 4

9.3 Reinstallation of solenoid valves

Insert solenoid valves (1 and 2) into the transmission housing and fix them by means of bracket and cylindrical screw M6x12 (3).

- 1 = Solenoid valve - parking brake - rear axle
- 2 = Solenoid valve - differential lock - rear axle

Tightening torque M6/8.8 $M_A = 9.5 \text{ Nm}$

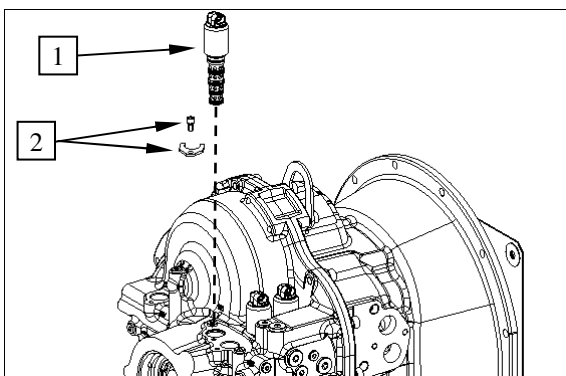


Figure 5

Insert solenoid valve Y2 (1) into the transmission housing and fix it by means of bracket and cylindrical screw M6x12 (2).

Tightening torque M6/8.8 $M_A = 9.5 \text{ Nm}$

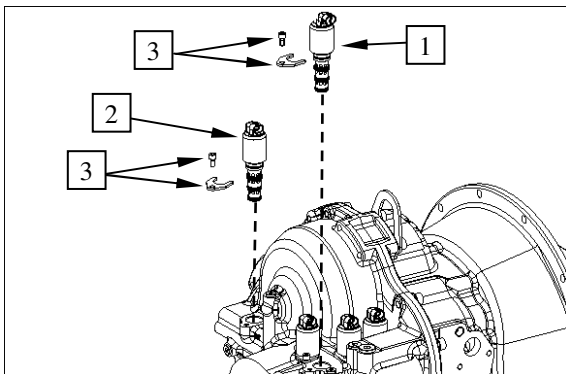


Figure 6

Insert solenoid valves Y1 (1) and Y3 (2) into the transmission housing and fix them by means of bracket and cylindrical screw M6x12 (3).

Tightening torque M6/8.8 $M_A = 9.5 \text{ Nm}$

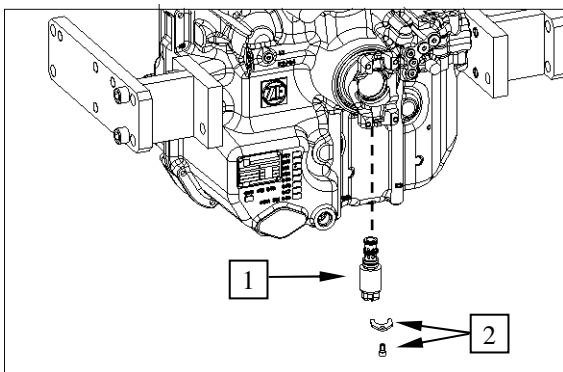


Figure 7

Insert solenoid valve YWD (1) into the transmission housing and fix it by means of bracket and cylindrical screw M6x12 (2).

Tightening torque M6/8.8 $M_A = 9.5 \text{ Nm}$

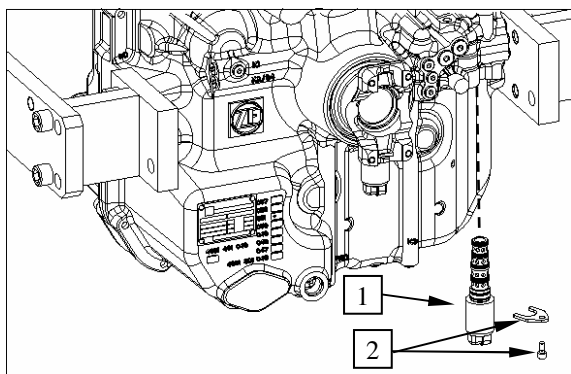


Figure 8

Insert solenoid valve Y5 (1) into the transmission housing and fix it by means of bracket and cylindrical screw M6x12 (2).

Tightening torque M6/8.8 $M_A = 9.5 \text{ Nm}$

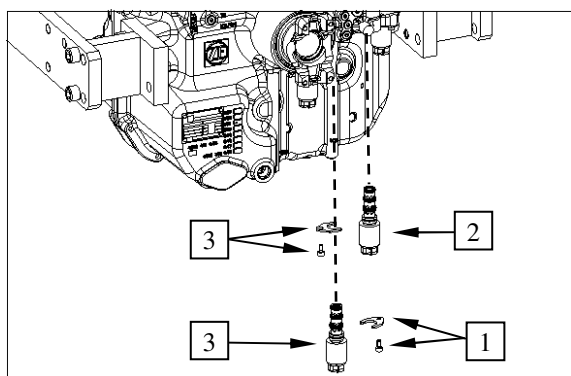


Figure 9

Insert solenoid valves Y6 (1) and Y4 (2) into the transmission housing and fix them by means of bracket and cylindrical screw M6x12 (3).

Tightening torque M6/8.8 $M_A = 9.5 \text{ Nm}$

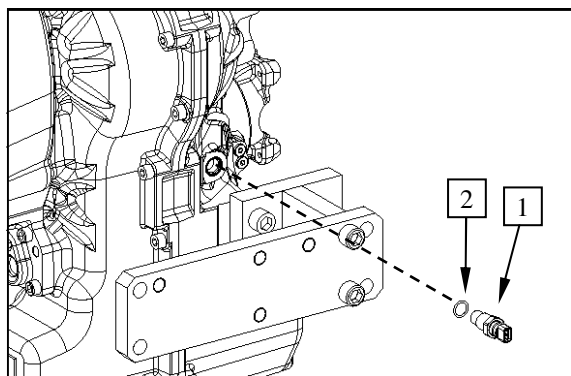


Figure 10

9.4 Reinstallation of inductive sensor (option)

Install inductive sensor (1) with O-ring 15x2 (2).

Tightening torque $M_A = 30 \text{ Nm}$

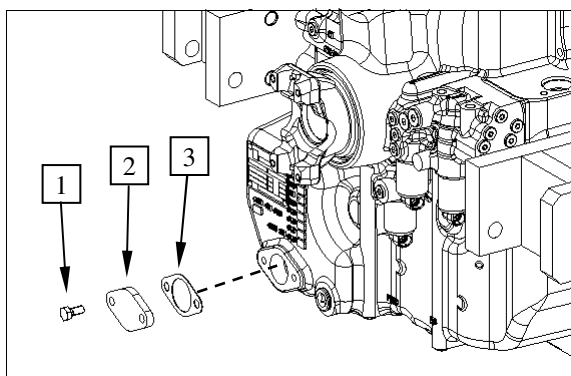


Figure 11

9.5 Mounting provision for oil filler tube (option)

Fix closing cover (2) and seal (3) with hexagon screws (1).

Tightening torque (M8/8.8x18)..... $M_A = 34 \text{ Nm}$

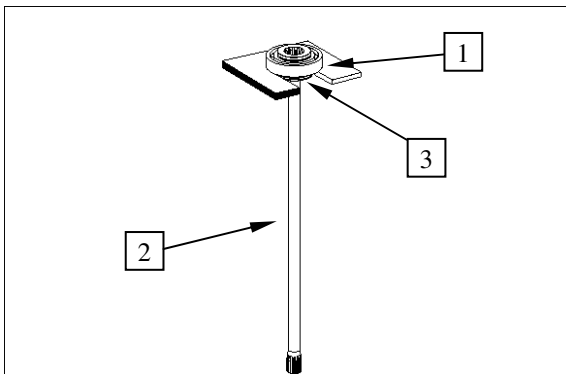


Figure 1

10. Reassembly of PTO

Press ball bearing 45x75x16 (1) onto the pump shaft (2) until contact is obtained.

Fit rectangular ring 50x2.5 (3).

Grease and centrally align rectangular ring.

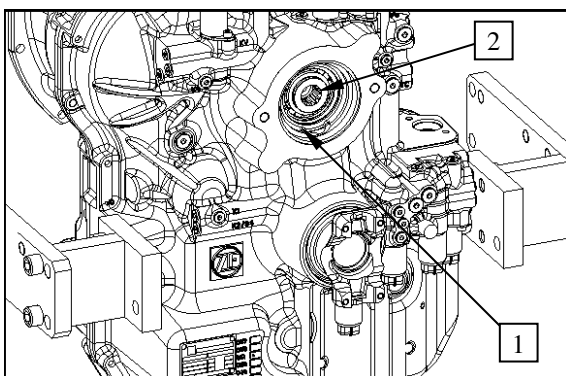


Figure 2

Mount pump shaft (2) until contact is obtained and fix it by means of retaining ring 75x2.5 (1).

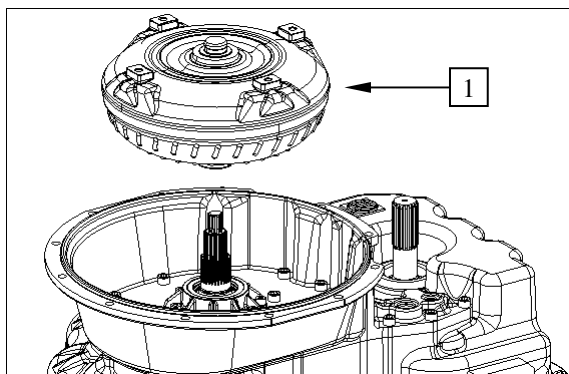


Figure 1

11. Reassembly of engine connection

Mount converter (1) until contact is obtained.

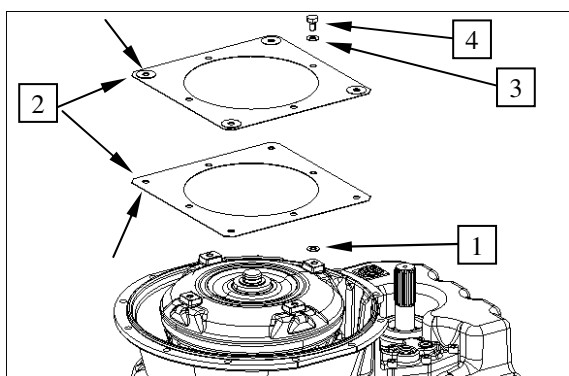


Figure 2

Position 1 washer/each / thickness=1.0 mm (4x) (1) onto the flexplate mounting webs (4x).

Place flexplates (2).

Pay attention to the installation position! Spot-welded reinforcing disks of the flexplate to be arranged towards the outside - see arrows !

Mount washer (3) onto the hexagon screw M10x16 (4) and fix flexplates.

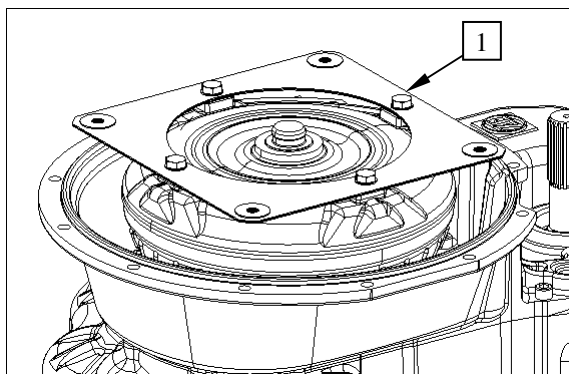


Figure 3

Tighten hexagon screws (1).

Tightening torque (M10/8.8x16) $M_A = 46 \text{ Nm}$

When reusing the hexagon screws these must be secured with Loctite 243!

New hexagon screws are already provided with adhesive (microcapsule). The microcapsule bursts when the screw is turned in, wets screw and nut thread and hardens.



**Fix converter axially!
Risk of injury!**

12. Reassembly of filter and oil drain plug

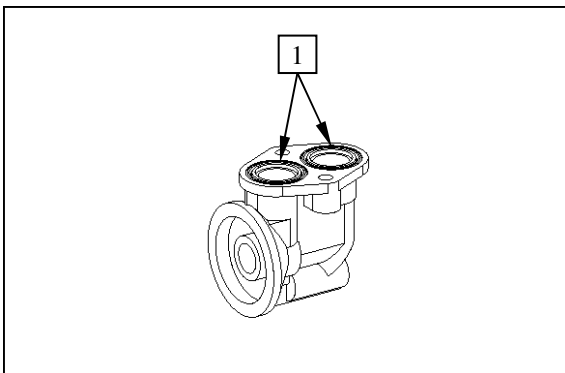


Figure 1

Place O-rings 34.2x3 (1) into the holes and grease them.

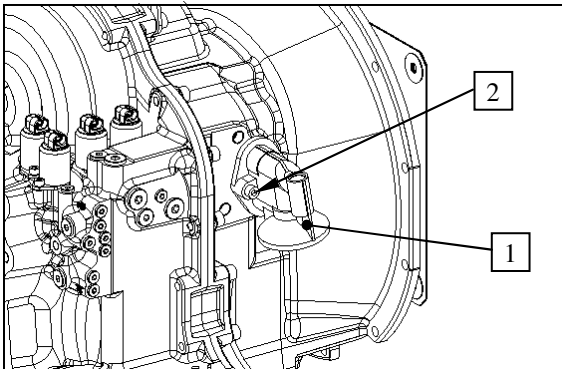


Figure 2

Attach filter head (1) with cylindrical screws M8x30 (2).

Tightening torque (M8/8.8X30) $M_A = 23 \text{ Nm}$

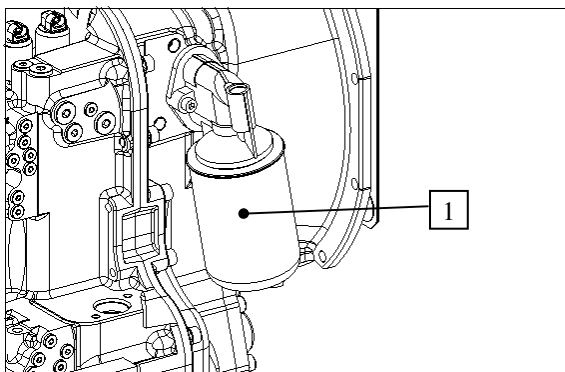


Figure 3



The ZF filter (1) has to be fitted as follows:

- Slightly oil the seal
- Turn in the filter until contact with the sealing surface is obtained, and then tighten it by hand with approx. 1/3 to 1/2 rotation.

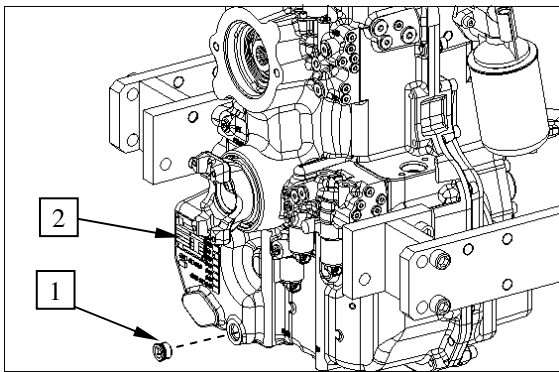


Figure 4

Fit oil drain plug 7/8-14 UN 2A (1).

Tightening torque (7/8-14 UN 2A)..... $M_A = 30 \text{ Nm}$

Fix identification plate (2) by means of 4 grooved pins 3x5.

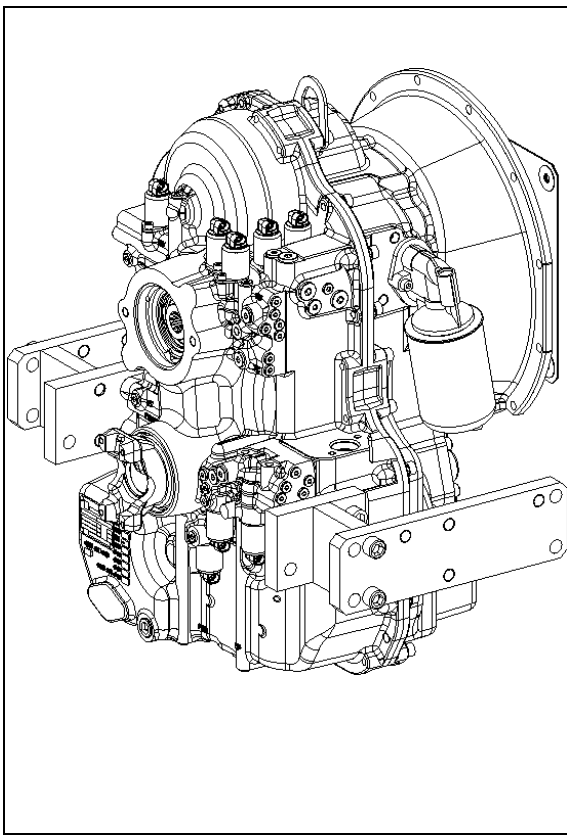


Figure 5

Before putting the transmission into operation, fill it with oil according to Operation Manual (Order No. 5872 137 002)!



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